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The

Geographical Journal.

No. 1. JULY, 1898. VOL. XII.

ANNIVERSARY ADDRESS, 1898.[*]

By the PRESIDENT.

SINCE I last addressed you at the beginning of the present session, much has happened of geographical interest. I informed you then that an appeal on behalf of a Government antarctic expedition had been made to Lord Salisbury. I may state that a reply was received from the Prime Minister's Private Secretary, with a promise that in the course of a few months we should hear further on the subject. Meantime the movement in favour of a British antarctic expedition has not stood still. A meeting of very great interest was held in the beginning of the year at the Royal Society, in which eminent authorities in various departments of science and of various nationalities met to discuss the subject. They were unanimous in insisting on the necessity of renewing antarctic exploration, and on the duty of the British Government to take a substantial share in it. The Germans themselves have been active in this direction. A German expedition is at this moment being organized on a liberal scale, and funds are being collected throughout Germany for the purpose. It would be a matter of prime importance if it could be arranged that a British expedition should take the field at the same time as the German expedition, and that all should work on a common plan, so as to ensure the best results. Moreover, there is reason to hope that the Norwegian Government might send out an expedition also, perhaps under the leadership of Dr. Nansen, to carry out exploration mainly on land. Meanwhile the Belgian expedition, under M. de Gerlache, has been actively engaged in carrying out the work for which it was organized. The expedition, liberally supported by Sir George Newnes, under Mr. Borchgrevink is, I believe, in an advanced state of preparation.

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[*] Read at the Anniversary Meeting of the Society, May 23, 1898.

With regard to the arctic regions, we have recently had three important meetings dealing with the subject. The session opened with a paper by Mr. Jackson on the Jackson-Harmsworth expedition to Franz Josef Land, and from what we heard from Mr. Jackson himself and from his four companions, we have reason to hope that when the full account of this expedition is given to the world, it will be evident that it has made an important and substantial contribution to our knowledge of arctic conditions. Lieut. Peary has at last been able to tell us in person of his expeditions to Northern Greenland, and these have been considered so important that the Council have awarded him a Royal Medal. Lieut. Peary was to have proceeded to Northern Greenland again this summer for the purpose, among other things, of making an attempt to reach the pole, on a plan which he has carefully considered. Unfortunately, the war which has broken out between Spain and the United States may compel Lieut. Peary, as a naval officer, to remain at his post of duty. Let us hope that his departure has only been postponed for a short period. Captain Sverdrup has announced his intention of proceeding to the same part of the arctic regions, his main object being to lay down, if possible, the unknown north and north-east coast of Greenland.

I need only recall the excellent account given at one of our meetings by Colonel Feilden, of the visit of himself and Mr. Pearson last summer to Novaya Zemlya, and the remarkably open sea found in that quarter. Mr. Arnold Pike told us that he found it equally open off the east coast of Spitsbergen, as did the walrus hunters who visited Franz Josef Land about the same time. Sir Martin Conway again visited Spitsbergen during the summer, and, in conjunction with Mr. Garwood, made important contributions to our knowledge of the physical geography of the interior of the main island. We know of two important expeditions proceeding to the same portion of the arctic regions this summer—a Swedish expedition under Dr. Nathorst, and a German expedition, the object of both being to examine the seas in the neighbourhood of Spitsbergen and Franz Josef Land.

Germany indeed is setting an admirable example in scientific exploration. Besides the antarctic expedition referred to, the German Government has made a grant of £15,000 for oceanic research, especially in the Atlantic and Indian oceans. In the North Atlantic much good work was done under the joint co-operation of the Swedish, Norwegian, German, and British governments. The minister for Sweden and Norway, in London, has, by instruction from his Government, brought the subject under the notice of our Foreign Office, with a view to a renewal of their joint work. How important it is even from the practical point of view, has been strikingly shown by Prof. Pettersson, the distinguished oceanographer, who demonstrates that an adequate knowledge of temperatures, salinity, etc., at various depths, is absolutely essential to a successful prosecution of deep-sea fishing, as on them to a large extent depends the migration of the fish, both horizontally and vertically. And even more important he shows that on these conditions the weather of Western Europe also depends, and by their study the accuracy of weather forecasts can be increased. It is to be hoped our Government will see it to be its duty and its interest to join in a work which so nearly concerns an important national industry.

The scientific value of oceanographic research was strikingly illustrated in the valuable paper so recently contributed to the Society by the Prince of Monaco. Not less important was the remarkable paper by Sir John Murray, on the distribution of surface temperatures in the ocean and its bearings on oceanographical problems.

Before quitting the polar regions, I must express a hope that during the coming summer we may receive authentic information concerning the hazardous balloon expedition undertaken by Mr. Andrée, and that the information may be such as will satisfy us of his safety.

One of the most remarkable papers of the session, and indeed of any session, was that of Dr. Sven Hedin concerning his three years' explorations in Central Asia. I am sure you will agree with me that the great work accomplished by him richly deserves the many honours he has received since his return. Of Mr. Savage Landor's hazardous attempt to reach Lhasa we expect to have a full account shortly, and there is good reason to hope that the sufferings he underwent will not be without some compensation in the contributions which Mr. Landor has been able to make to the geography of Southern Tibet.

The trying campaign on the north-west border of India, which had to be carried on during the past year under my old friend Sir William Lockhart, was rendered still more difficult by our absolute ignorance of the geography of the greater portion of the region concerned. One good result of the campaign has been a substantial addition to our knowledge of the geography of this complex mountain region. The force was accompanied by a survey party under Colonel Sir Thomas Hungerford Holdich, and he has presented a valuable paper to the Society, with maps and photographs, which I am sure will be read with interest. It is hoped that Sir Thomas Holdich will be able to read it at one of our evening meetings before the close of the session. Captain Deasy has written to the Society from Yarkand, which he has reached, after doing some useful exploring work *en route*. He has discovered that the Yarkand river is very inaccurately laid down on our maps, and he proposes to devote several months to exploring the country around Yarkand, including the Takla Makan desert. Captain Pottinger has returned to England from his unsuccessful attempt to solve the problem of the great rivers that come from Tibet south through the Indo-Chinese peninsula. Although compelled to abandon his expedition, he succeeded in traversing some unknown country on the Upper Mekong, and we may expect to have some account of his journey from himself. Further south, we have had another interesting paper from Mr. Warington Smyth, on his journeys in Siam; this time in the little-known East Coast States. He has just given to the world, in book form, a full account of all his journeys, which will show that he well deserves the award which the Council have made him.

We were all of us greatly interested in Mr. Cavendish's account of his journey in Somaliland, and cannot but regret that circumstances have prevented his undertaking another expedition, in which he hoped to strike across that difficult country lying between Somaliland and the Upper Nile, of which we know almost nothing. It is a country which several young explorers are longing to attack, and it is to be hoped that England will have the honour of opening up one of the few remaining regions in Africa that still await the pioneer. One of these young explorers, Mr. Jennings Bramley, recently made an attempt to penetrate southwards to the Central Sudan from Cairo. Unfortunately, he was compelled to turn back, though there is reason to hope that he may resume the hazardous attempt—let us hope, this time with success. It will be remembered that Mr. Bramley recently contributed an interesting paper to the *Journal* on his visit to the oasis of Siwa, from which another young Englishman, Mr. Silva White, has just returned, after having made some interesting archæological discoveries. Mr. White had intended to push on to the headquarters of the Senussi, in the south of Tripoli; but, as might have been expected, he found this impossible. A French explorer, M. Foa, a Fellow of our Society, has recently completed an interesting journey, lasting about three years, across Africa, from the Zambezi to the mouth of the Congo. Though his object was mainly sport, he visited one or two almost unknown regions, concerning which he has, no doubt, brought back welcome information. Major Gibbons, from whom we had a valuable paper last session on the Borotse country, has again just started, at the head of a well-equipped expedition, to further explore this region, and to continue northwards to Lakes Bangweolo and Tanganyika. Of Lake Bangweolo Mr. Poulett Weatherley has made a very complete examination, and has circumnavigated it. He has been in this region for about three years, and, from the voluminous letters which he has sent home, a paper has been prepared, giving an account of his work, which will be communicated to the Society next month. His very numerous whole-plate photographs are much above the average of photographs taken under similar circumstances. The subjects have been selected with unusual discrimination, and afford an impressive conception of the country in which he is sojourning. Mr. Alfred Sharpe, H.M. Commissioner in the British Central African Protectorate, has brought home with him an excellent map of the Protectorate, which has been the work of several years, and which, it is hoped, the Society may be able to publish at an early date.

From America we have had two papers during the past session of unusual interest. We were all glad to listen to Mr. William Ogilvie's account of the Yukon region, in which, in connection with the Klondike gold discoveries, so much interest at present centres. Mr. Ogilvie, we know, is the one trustworthy and competent authority on this country, and the very accurate information he was able to give on the geography of the country cannot but be of great practical value. The Canadian Government expedition to Hudson's Bay, whatever may be the practical results as to navigation, has made a very important contribution to our knowledge of the shores of the bay and of its ice-conditions. The complete report has only just been issued. Mr. Fitz Gerald's graphic account of the explorations accomplished by his expedition in and around Aconcagua, entitles him to take a high place among what may be called high-level geographers. Amid many difficulties and discouragements, he and his companions succeeded in making an accurate detailed survey of a region of great interest to the physical geographer —a region of which his splendid photographs afford a wonderfully clear conception. It is such detailed study of limited regions that geographers now desire more than anything else. Mr. Pratt, who some years ago did good work on the Tibetan border, has just returned from an expedition to the western portion of the republic of Columbia, during which he visited some districts almost unknown; while Major Stanley Paterson, amid many difficulties, succeeded in penetrating into an unvisited portion of Northern Venezuela.

From Australia we had recently a paper of much interest by another young explorer, Mr. David Carnegie. It was a carefully planned and successfully carried out expedition, and was of special importance in that it crossed, in a north and south direction, the routes of various previous explorers, running in an east and west direction.

These are some of the principal subjects that have been brought before us at the ordinary evening meetings of the Society. But besides these we have had special afternoon meetings, in which important subjects in scientific geography have been discussed by specialists. Mr. Vaughan Cornish's very able paper, describing his researches on sea-beaches and sandbanks, gave rise to a most interesting discussion by men specially competent to deal with the subject. Equally important and equally interesting in its way was Dr. Sambon's paper on the possibility of European acclimatization in tropical countries. The vast importance of this subject is evident to all, and whatever may be thought of the position maintained by Dr. Sambon and Dr. Manson, it will be agreed that the subject is one that deserves the closest investigation and discussion by competent specialists. Not less suggestive and interesting will be the paper by Prof. Geddes, to be given in a day or two on "The Influence of Geographical Conditions on Social Development."

All this will show how very varied are the subjects which come under the consideration of the Society, and how wide is the conception which it entertains of the field of geography. That conception is widening more and more in this country, and if thoroughly trained and competent young men are encouraged to devote themselves to the various sections of our wide subject, the results cannot but be of the greatest benefit to our science.

During the year the great work of cataloguing, according to subjects or localities, the whole of the contents of the library has been carried forward steadily by the librarian and Mr. Heawood. More than 80,000 title-cards have been prepared; and the end of the collection of these titles may now be said to be in sight. Already the 15,000 bound books and the 7000 pamphlets have been catalogued, and 7000 of the 9000 volumes of bound geographical publications have been carefully looked through, and the titles of all important papers they contain copied out on cards to the number of 58,000. In the case of the Russian, Hungarian, and other little-known languages, a translation of the title in English is also given. There remain about 2000 volumes of publications to be discussed, and these will probably require about ten cards per volume on the average, or a total of 20,000 additional titles. At the present rate of progress, rather less than ten months will be required for the collection of titles, and the whole set will then number about 100,000.

The classification is now so far advanced that it can proceed as rapidly as the preparation of the cards admits, so that no delay will arise on that account. After the collection is complete, a certain number of the cards must be duplicated for classification under different headings, and then there will be the question of printing to consider. This is not, however, an urgent question, as the utility of the work in the Society is greater in the form of a card catalogue than it would be in the form of volumes.

A natural difficulty which presents itself in any work of the kind is that, once completed, it soon falls out of date, and supplements have to be compiled with great labour. In the present case that has been entirely overcome. For the last six years every accession to the library—be it book, pamphlet, or paper—has been recorded in the *Geographical Journal*, and the titles, month by month (now averaging 200), have been pasted on cards and classified. The catalogue is thus automatically kept up to date as part of the ordinary routine of library work, and this catalogue of the most recent, and usually the most important geographical publications, is at present kept fully classified in 26 boxes, with 420 separate subdivisions.

The classification of geography has been carefully studied by Dr.

Mill, who has explained the principles to be followed and given a statement of the provisional subdivisions adopted for the catalogue in the February number of the *Journal*. The experience acquired in the preparation of the subject catalogue has enabled the Society to render help to the Royal Society in its magnificent project of an international subject catalogue of scientific literature, the successful inauguration of which promises to be a worthy tribute to the beginning of the coming century.

The library continues to be the scene of considerable activity in geographical study both for fellows and foreign visitors, and with its increasing usefulness the unsuitable nature of its housing becomes even more apparent. While the introduction of the electric light has stopped the destruction of bindings due to burning gas, the small rooms and many open fires throughout the house subject the books to the scarcely less disagreeable effects of sooty dust, and to the ever-present risk of fire. Only a new building planned for the accommodation of our unique geographical library and fitted with the safeguards that experience has shown to be necessary can overcome these inconveniences.

The most notable geographical publications of the past year have perhaps been in the department of historical geography; and it is with no little satisfaction that we recognize the profound and scholarly research of one of our own fellows, Mr. J. G. Frazer of Trinity College, Cambridge, whose translation and discussion of Pausanias's "Geography of Greece," in five goodly volumes, shows that this country can still claim a leading place in the production of works of the first importance. Baron Nordenskiöld's "Periplus" is another example of the rich results which reward the study of the historical aspect of our science.

On the physical side of geography we must recognize the enterprise of the Berlin Geographical Society in publishing the superb record of Dr. von Drygalski's work on the glaciers of Greenland. French geographers also deserve our congratulations on M. Delebecque's fine work on the lakes of France; and perhaps they incur our just envy on account of the graceful and accurate translation of Suess's classical treatise, "Das Antlitz der Erde," under the charge of M. le Margerie. The lack of translations of the masterpieces of foreign geographers is a reproach to the English language and to British publishers. Prof. Ratzel has shown, in his recently published "Politische Geographie," how great is the tribute which scientific geography may pay to practical life and political methods.

Among English publications, Mrs. Bishop's admirable book on Korea deserves special recognition; and the study of our own island has been greatly promoted by the publication of the complete geological map of England on a scale of 4 miles to the inch by the Geological Survey, and of Sir Archibald Geikie's geological map of England on the scale of 10 miles to the inch by Mr. Bartholomew, a masterpiece of colour-printing.

The cause of geographical education has been furthered by the presentation at the Toronto meeting of the British Association of a report drawn up by Mr. Herbertson for a committee on the present condition of geographical education in the United Kingdom. It is a valuable supplement to Dr. Keltie's report prepared for the Society in 1884, and shows much progress, if not enough to satisfy those who have the improvement of education at heart.

Both at Oxford and Cambridge geography continues to improve its position. As you know, at Oxford the University bears the entire expense of the readership. After long and careful consideration, the Council decided to continue the Society's contribution to the Cambridge lectureship, on the understanding that the University would take it over at the end of five years, and that the lecturership would be elevated to a readership. The reader, Mr. Yule Oldham, sends the following report of the work during the past year:—

"The marked advance which was made last year has been well maintained. I have again lectured on the geography of Europe for historical students and on physical geography for geological students to good classes, while a special lecture on the north-west frontier of India attracted an audience of over a hundred. For the University Extension Scheme I have given a considerable number of lectures, notably courses of twelve lectures at Leicester and twenty-four at Cambridge, which were largely attended and led to much excellent work.

"In the region of examinations, progress has again been made. Last summer, for the first time, geography was included as a special group in the Higher Locals; steps are now under consideration for the purpose of giving greater prominence to physical geography in the Senior and Junior Locals, while a large number of colleges here have agreed to make physical geography a subject for their science scholarships.

"The period of five years for which I was appointed Lecturer in Geography ends with this summer, but the work initiated and supported by the Society has not been fruitless. In place of a lectureship, the University has established a readership in geography, an office of greater position, permanence, responsibility, and opportunities, to which I have been appointed. As reader, I shall have seats on the special Boards for Geology and for History, and I anticipate better opportunities for advancing the interests of geography."

With regard to Oxford, Mr. Mackinder writes: "During the Michaelmas Term I lectured twice a week, to 40 men from 13 colleges, and 13 ladies from 3 colleges. During the Hilary Term, I lectured to 53 men from 12 colleges, and 12 ladies from 3 colleges. During the Summer Term I have given no public lectures; but, at the invitation of 3 different colleges, I have given 3 courses of private lectures, in each case to about 20 men. This is a considerable development of similar work undertaken for the first time—on a smaller scale—last year.

"At Gresham College I have delivered my usual course of 25 lectures. It has been steadily attended by 220 persons, of whom 140 wrote weekly essays for my assistant, Mr. A. W. Andrews, M.A., of Magdalen College, Oxford, and 120 earned the Sessional Certificate of the London University Extension Society in Examinations conducted by Mr. A. J. Herbertson, of the Heriot Watt College, Edinburgh. The fact that many teachers come to the lectures session after session is worthy of note. One case, indeed, has been brought to my knowledge of a teacher who has attended these geographical courses for seven successive years, and several have attended for four."

The measures adopted by the Council last year for increasing the efficiency and extending the scope of the system of instruction conducted by Mr. Coles, have quite fulfilled our expectations. Our diploma is granted to those pupils who pass a satisfactory examination before a committee composed of two members of our Council and of Mr. Coles. The examination consists of observations for latitude and longitude, adjustment of instruments and computations, azimuth observations, surveyings with prismatic compass, tachometers, and plane-table, plottings from the field-book, and map-projection.

Last year (1896–97) forty-one intending travellers received instruction from Mr. Coles, one of whom was granted the Society's diploma. In the present year (1897–98) sixty-five intending travellers have received instruction, being an increase of twenty-five, and five of these have passed before the committee and received diplomas, one of them being a lieutenant in the navy. Among the pupils there were twenty-six civilians, twenty-four officers of the army and navy, four in the colonial service, four civil engineers, and two missionaries.

The Society owes much to Mr. Coles for the pains and trouble he has taken, and for the time he has devoted to the work of teaching; often working with his pupils until late at night, and looking over their work early in the morning. He has made his system of instruction a great success, and it is certainly one of the most important branches of the work of our Society. From year to year we shall increase the number of well-trained explorers and travellers, and the work that is sent home to us will proportionally increase in value.

This year we have reached and passed the four-thousandth figure in the number of our Fellows. This is a landmark in our progress; while the most notable events in our history this year are the grant of diplomas and the creation of a growing number of trained scientific explorers.

THE FOURTH CENTENARY OF VASCO DA GAMA'S VOYAGE TO INDIA.

On May 16, a special meeting of the Society was held in commemoration of the fourth centenary of Vasco da Gama's discovery of the Cape route to India. The President, Sir Clements Markham, was in the chair, and the meeting was honoured by the presence of their Royal Highnesses the Prince of Wales and the Duke of York. Senhor A. de Castro, the *chargé d'affaires* of Portugal, was also present as representative of his country. The President addressed the meeting as follows :—

VASCO DA GAMA.

By the PRESIDENT.

We are assembled this evening to commemorate one of the greatest events in the history of the world—the discovery of the ocean route to India by the Portuguese. Vasco da Gama completed the mighty enterprise on the day when the ghâts of India were sighted from the deck of his ship just four hundred years ago to-morrow. The credit of this discovery is due to the Portuguese people, to their constancy and heroic perseverance, even more than to the skill and ability of their leaders; and I think that many of the illustrious navigators of Portugal are equal in merit, and should be equal in renown. We contemplate the perseverance of this people and the continuity of their work during a century and a half of mighty effort, rather than a single stroke of genius. Yet it is right that Vasco da Gama, who forged the last link, should have the first place which Camoens has assigned to him, *primus inter pares*.

Prince Henry gave the first impetus, and during a quarter of a century he created a school of seamen who rounded Cape Bojador in 1435, Cape Blanco in 1443, Cape Verde in 1445, and reached the Gambia in 1454. All this was done in the lifetime of the Prince Navigator. At his death the work was continued, with almost equal zeal, by the kings—his nephews—Alfonso the African, Joaõ the Perfect Prince, Manoel the Fortunate. Portugal was indeed fortunate in her sovereigns of the house of Avis, fit guides and leaders of the little hero nation, as Schlegel calls her. The ships of Alfonso reached Sierra Leone in 1462, made a colony at Lamina, on the coast of Guinea, crossed the equator, and sailed as far south as Cape St. Catherine. His son, "O Principe perfeito," sent Diogo de Azambuja to found the castle at Lamina, and Diogo Cam to push southward, until at length the Congo was reached.

The *padraos* were intended to be eternal monuments of Portuguese achievement. They were stone pillars with an inscription, and the arms of Portugal carved upon them—the well-known "cinco chagas," with the orle of the seven castles of Algarve. Each explorer was to plant one on a conspicuous point at his furthest point. The *padraos* were named after saints. That of Santo Agostinho (once planted in 13° 27′ 15″ S. (south of Benguela)) is now in the museum of the Geographical Society at Lisbon, as well as that once on Cabo Negro, in 15° 40′ 30″ S. Two of these *padraos* were on the arms granted to Diogo Cam, the discoverer of the Congo.

It was the ambition of each successive Portuguese voyager to plant a national monument beyond the furthest point reached by his predecessor. None had been so zealous in this glorious work as the family of Diaz, whose first sailor scions were trained in the school of Prince Henry. Joaõ Diaz rounded Cape Bojador, Dinis Diaz first reached Cape Verde, and Bartholomeu Diaz was destined to complete the maritime fame of his family by being the first to round the southernmost point of Africa, planting *padraos* as he proceeded. In 1487, Bartholomeu Diaz passed the Table mountain undiscerned amidst the stormy waves, rounded Cape Agulhas, the southernmost point of Africa, and reached the Great Fish river, which he named after his companion, Joaõ Infanta. It was with great reluctance that the gallant Diaz, complying with the urgent entreaties of his crew, shaped a course homewards; and then it was that he first sighted the cape, which received from him the name of Cabo Tormentoso, and which the king changed to the Cape of Good Hope. Covilham, exploring southwards from Egypt, had discovered the whole east coast of Africa as far as Sofala, and had sent a full report from Cairo to King Joaõ. So that there was nothing left to discover, except the bit of African coast from the Great Fish river to Sofala.

The goal was well in sight. The eastern side of Africa had been reached by Diaz, and was known through the report of Covilham. Thence the next explorer would stretch across to the shores of India. King Joaõ prepared for the final and crowning expedition by the building of two suitable ships, which were commenced under the superintendence of Bartholomeu Diaz, the ablest and most successful Portuguese explorer of that age. But in 1495 the king died, and the great work remained to be achieved in the reign of his successor, King Manoel ("O Fortunado"), who was at the head of Portuguese affairs for the next fifty-six years. He continued the equipment of the expedition, which had been commenced by his predecessor.

Then it was that Da Gama appeared on the scene. Camoens introduces him—

> "Vasco da Gama, valiant capitayne,
>   For derring do the noblest volunteer;
> Of notable courage and of noble strain,
>   Whom smiles of constant fortune love to cheer."

The Da Gamas came of an ancient, valiant, and loyal house, their ancestors having fought by the side of Alfonso III. in the conquest of Algarve from the Moors, and by the side of Alfonso V., "the Brave," at the battle of Salado. Estevan da Gama, their father, was chief magistrate of Sines; and here Vasco and his brothers were born. The little town of Sines is situated in a bay, about halfway between Lisbon and Cape St. Vincent. To the west are the blue waves of the Atlantic but to landward an undulating sandy plain extends for several leagues On the north side of the bay there is a granite ridge running out int the sea, and on the top of the cliff there is a small church built b Vasco da Gama towards the end of his life.

The four sons of Estevan da Gama appear to have been born and brought up at Sines; but I believe that little or nothing is known o them before the date of the great expedition. The two ships ha been built, the *Sam Gabriel* of 120 and the *Sam Rafael* of 100 tons another vessel was purchased from a Lagos pilot named Berrio, and named after him; and a provision-ship of 200 tons was also got ready Then it was that Vasco da Gama was selected by King Manoel t command the expedition. He was not more than twenty-eight year of age. His eldest brother, Paulo, was equally fitted for the post, bu he insisted upon accompanying and serving under Vasco, in command of the second ship. They both looked upon Nicholas Coelho, who wa captain of the *Berrio*, as their brother.

Paulo da Gama was one of the kindest and most lovable of men, and his presence in the fleet was an influence for good. The best trait i the character of Vasco was his love for and devotion to his elder brother.

All things were prepared for the great enterprise, and the ships wer ready in the Tagus. The beautiful church of Belem was not then buil on the beach of Restrello, but Vasco da Gama passed the night befor his departure in prayer in a little chapel which had been erected ther by Prince Henry. He embarked next morning, and the expedition saile on Saturday, July 8, 1497; there were about 160 souls all told. Si *padraos* were taken out, to be set up on prominent headlands, but no one of them is now known to exist. The fleet was accompanied by th great navigator, Bartholomeu Diaz, as far as the Cape Verde islands He was going out in a fast caravel, to take up his command of the new Portuguese settlement of Lamina, on the coast of Guinea.

In December the expedition reached the "Rio do Infante," the furthes point of Bartholomeu Diaz on the eastern side of Africa, and entere upon new ground. Correa reports that there was a mutiny at thi critical time. The men feared to proceed further, and wanted to return according to this author, who adds that Vasco da Gama put the maste and pilot in irons for giving the same advice, and threw all thei instruments overboard. His brother Paulo induced his crew to obe orders by argument and persuasion, and interceded for Vasco's prisoners This mutiny is not mentioned in the "Roteiro."

The first experience of the explorers on entering the previousl unknown ocean was the force of the current, so strong that they feare it might frustrate their plans, until a fresh stern wind sprang up, whic enabled them to overcome it. This Agulhas current was first scientifically investigated by Major Rennell in 1777.

Vasco da Gama passed the coast, which was named by him "Natal," on Christmas Day, and was well received by the natives of Delagoa bay. He was at Quillimane in January, 1498; at Mozambique in March; and he reached Melinde on April 15. There was a terrible outbreak of scurvy off Mozambique, and again on the way home; and then it was that Paulo da Gama proved the guardian spirit of the expedition, giving up all his own private stores for the use of the sick, ministering to them, and warding off despondency by his words of encouragement and by his example.

The King of Melinde supplied the Portuguese with an Indian pilot, a native of Gujarat, and on April 24 the voyage was commenced across the Indian Ocean, from the east coast of Africa to Malabar. Before starting, Vasco da Gama, with the hearty concurrence of the King of Melinde, set up one of the *padraos*, with the escutcheon of the *Quinas* carved on one side, and a shield bearing a sphere on the other. Beneath was King Manoel's name. It was placed on a hill above the town.

A voyage of twenty-three days brought the adventurous discoverers in sight of the mountains above Malabar—an event which Camoens thus relates:

"Pale shone the wave beneath the golden beam,
Blue o'er the silver flood Malabria's mountains gleam;
The sailors on the maintop's airy round
'Land! Land!' aloud with waving hands resound.
Aloud the pilot of Melinda cries,
'Behold, O Chief, the shores of India rise!'
Elate the joyful crew on tiptoe trod,
And every breast with swelling raptures glowed.
Prone on his manly knees the hero fell;
'Oh, bounteous Heaven!' he cries, and spreads his hands
To bounteous Heaven, while boundless joy commands
No further word to flow."

Then the immortal poet, in words of fire, declares how this mighty deed was done, and by what kind of men:

"*Not* those who ever lean on ancient strain,
Impinge on noble trunk a barren chain;
Not those reclining on the golden beds,
Where Moscow's zebelin downy softness spreads;
Not with the novel viands exquisite;
Not with the languid wanton promenade;
Not with the pleasures varied infinite,
Which generous souls effeminate, degrade;
Not with the never conquer'd appetite,
By fortune pamper'd as by fortune made.
But by the doughty arm and sword that chase
Honour which man may proudly hail his own;
In weary vigil, in the steely case,
'Mid wrothsome winds and bitter billows thrown,

> Suffering the frigid rigours in th' embrace
> Of South, and regions lorn and lere, and lone,
> Swallowing the tainted ration's scanty dole,
> Salted with toil of body, moil of soul.
> Thus honour'd hardness shall the heart prevail,
> To scoff at honours, and vile gold disdain.
> Whoso shall rule his life by reason's light,
> Which feeble passion ne'er hath power to hide,
> Shall rise (as rise he ought) to *honour true*,
> Maugre his will that ne'er hath stooped to sue."

And thus was the Portuguese empire in India founded by two of Portugal's noblest sons, Vasco and Paulo da Gama. Time will not allow us to linger with them on the coast of Malabar. On March 20, 1499, they cleared the Cape, and returned to Lisbon on September 18. But Paulo da Gama had died at Terceira, in the Azores. Equal to Vasco in heroism and constancy, Paulo excelled him in the more Christian virtues, and was, as I have already said, the guardian spirit of the voyage. When Vasco is remembered, Paulo da Gama should never be forgotten. They are equal in merit, and both equally deserve to have their memories honoured by their country, and by the civilized world.

True to the spirit of perseverance and energy which had led the Portuguese to this crowning success, a large fleet was despatched to India in the year after the return of Vasco da Gama, and in each succeeding year. Vasco da Gama commanded the fourth voyage in 1502, and on his return he was created Count of Vidigueira. Then followed the brilliant achievements of Afonso d'Albuquerque, who occupied Goa, Ormuz, and Malacca, and established Portuguese power in India on a solid foundation. It was to last unchallenged for eighty years, when the disaster of El Kasr-el Kebir brought on what the Portuguese called the sixty-years' captivity.

For twenty years Vasco da Gama was unemployed, living at a house in Evora, the walls of which were painted with figures of Indian animals and plants, and hence the street in which it stood is still called "Rua das Casas Pintadas." Here he brought up a family of six sons; but in 1524 he was called from his retirement to rule over Portuguese India. He went out with a large fleet, surrounded by all the pomp and circumstance of a viceroy, and he died at Cochin, on the scene of his discoveries, on Christmas Day, 1524, aged 55.

Vasco da Gama is described as a man of middle stature, rather stout, and of a florid complexion. The portrait, which belonged to Count Lavradio, is given by Lord Stanley of Alderley, in his translation of the account of Da Gama's voyages in the 'Lendes da India,' of Correa. It is a copy of the portrait in the Museu das Bellas Artes at Lisbon, a photograph from which is given in Ravenstein's 'Roteiro.' It represents a handsome man, aged about fifty, with a white beard and severe expression, wearing a furred robe, and the cross of the order of Christ hanging from a chain round his neck. *His crest* was a girthed doe trippant, or. *Arms*—chequy of fifteen, or and gules; two bars argent; over all an escutcheon with the *quinas* of Portugal.

Luis Camoens, the great epic poet, is said to have been born in the year that Da Gama died; and Lord Stanley says, I think truly, that the name Vasco da Gama has left in history is due largely to the great genius of Camoens. "The discovery of India," says Schlegel, "the greatest event of modern times, could only be worthily celebrated by one who had himself passed a portion of his life in those regions. A warrior could only thus have written.

"At the proudest moment of that brief but glorious period of Portugal's greatness, one great national song broke forth, like the dying note of the fabled swan, a dirge for the departing hero-nation. The remembrance of her departed glory is enshrined in this immortal work, created by the divine genius of her national poet to immortalize her fame. The exquisite bloom and grace of the diction of Camoens are unparalleled among modern writers." *

The most learned and accomplished English traveller of modern times, the late Sir Richard Burton, devoted twenty years of his life to the study and translation of the 'Lusiads of Camoens.' He declared that he felt a glow of pleasure at having undertaken it—at having lived so long in contact with so noble a spirit as that of his master. He also took pride in the ambition of familiarizing his fellow-countrymen with a workman and a work not readily to be rivalled in the region of literature. No single publication extant gives so full and general a portrait of Camoens, his life and his work, as that of Sir Richard Burton, and his translation is undoubtedly the most faithful and the best in our language. The Hakluyt Society, of which I have the honour to be President, has also laboured to make the achievement of Vasco da Gama better known in this country. In 1869 we brought out the 'Lendas' by Gaspar Correa, translated and edited by Lord Stanley of Alderley; and this year, with a view to celebrating the present commemoration, we have published the 'Roteiro' of the first voyage, which has been ably translated and edited by Mr. Ravenstein.†

After the sixty years of captivity came to an end, Portugal rose like a phœnix from its ashes. The old alliance with England was renewed. It was commenced when the founder of the house of Avis, the great King Joaõ of Good Memory married that English princess, who bore him five noble sons, including Prince Henry the Navigator. Since 1640, the year of liberation, English and Portuguese have fought side by side on many a battle-field for freedom, we have formed alliances, and now our royal houses are nearly related. There are many reasons why England should feel warm sympathy for Portugal in the commemoration of the mighty deeds of her sons. The nation of heroic memories has a glorious history to be proud of; and by the commemoration of the discovery of India by Vasco da Gama, we hope that those memories will impress themselves even more strongly than ever on the minds of her sons, leading them on to an honourable and prosperous future. We wish health and happiness to his faithful Majesty, and success and prosperity to our old and tried ally, the noble Portuguese nation.

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* Schlegel.

† Bound copies of the 'Roteiro' were presented to the Prince of Wales and the Duke of York on this occasion, by the President.

After the address, the PRESIDENT requested M. A. de Castro, the Portuguese *chargé d'affaires*, to address the meeting.

M. de CASTRO: In the name of the King and of His Majesty's Government, whom I have the honour to represent on this occasion, I beg of you to accept His Majesty's and the Government's most sincere congratulations and their heartiest thanks for the spontaneous and the brilliant homage to the memory of that Portuguese who not only was a great man for his own country, but who rendered so important and so valued a service to the whole civilized world, by opening a way across seas never before navigated for commerce, civilization, and Christianity. The life and the glorious deeds of Vasco da Gama and his daring companions were so thoroughly brought before you by the President of this learned Society, that I feel it to be beyond my power to add to what has been already said. The kind words used by Sir Clements Markham towards Portugal—which I shall not fail to transmit to my Government—will, I am sure, be highly appreciated by them, as well as by the whole Portuguese nation, and I avail myself of this opportunity to pay a tribute to the Royal Geographical Society of London, which upon all occasions and opportunities has shown its great sympathy with, and its high esteem for, my country. The high honour which their Royal Highnesses, the Prince of Wales and the Duke of York, have conferred by their presence at this meeting, and for which I find no words to express the gratitude of my country, shows not only the great interest and the appreciation of their Royal Highnesses for all memorable events, but is also a most precious token of friendship between the old allies, Portugal and England. I wish to also tender the thanks of the Portuguese Government to the Right Hon. Lord George Hamilton for the brilliant part her Majesty's Government takes in the celebration, by sending to the Tagus, to join in the festivities which are now taking place at Lisbon, six magnificent ships from the Channel Squadron of England, for which, and for the prosperity and happiness of its great Queen and Royal Family, I express the most sincere desire.

The PRESIDENT: I now request Lord George Hamilton (Secretary of State for India) to address the meeting.

Lord GEORGE HAMILTON: In obedience to the request of the Chairman, I will add a very few words to the eloquent tribute which he has paid to the great navigator, concerning whom we have met here to-day. If there is anybody in her Majesty's dominions who will be likely to acknowledge the greatness of the feat by which for the first time he established water communication between India and the Western maritime countries of Europe—if there is anybody who would be disposed to recognize that feat, it is the representative of the Government of India, for it was in consequence of that discovery that we were hereafter able to found that dominion which I think is the boast of every Englishman. For if to Portugal is given the indisputable glory of having produced this great seaman, we, as Englishmen, have the satisfaction of knowing that we as a nation have probably derived more material benefit from those discoveries than any other country in the world. I do not think your President has in any degree exaggerated the importance of the discovery made in the voyage to which he has alluded. During the past few centuries there have been many inventions and many discoveries which have had a great influence upon the course of civilization, and which have shaped the policy and the course of various nations; but I doubt if there is any event which has ever had a more permanent and lasting effect upon the commerce and the trade and the policy of the Western maritime countries of Europe than the discovery that there was a free and uninterrupted watercourse between India and the West of Europe. For let us just depict to ourselves what was then the condition of the trade and the commerce of the civilized world. By far the most lucrative and important commerce was that which passed through India and through Central Asia to the eastern parts of the Mediterranean. So long as that commerce could only pass to Europe by land routes, those who lived in the vicinity of the Arabian or the Persian gulf had more or less the monopoly of those trade goods, and it was the object, so far as one knows from history, of almost every great sovereign and every great nation established in the eastern part of the Mediterranean to try to get as large a proportion as they possibly could of this lucrative trade; and not only did it give great wealth and power to those who inhabited the Asiatic side of the Mediterranean, but it also created a sea-carrying fleet for this commerce, and merchandise had to be carried from the Mediterranean to other parts of Europe. Those parts of Europe which were in the closest proximity to Asia naturally benefited the most from this commerce; and thus it came to pass that Greece, Italy, and the north of Africa practically monopolized the benefits of this lucrative trade. Spain, Portugal, France, Great Britain, and Holland were, by their inaccessibility to the ports at which this commerce debouched, practically precluded from getting any benefit from this trade. Vasco da Gama by one discovery destroyed the monopoly which the land-routes of this trade used to enjoy, and he contrived to disperse its benefits amongst the Western nations of Europe; but from the time his discovery was made there were numbers of adventurous rovers and seamen from all the countries I have indicated—from Portugal, from Spain, from France, from Great Britain, and from Holland—who, anxious to follow in his steps, coasted round the Cape of Good Hope. Then began the commencement of the founding of that series of colonies and of trade posts all along the eastern coasts of Africa and the southern coasts of Asia—a process that has gone on up to this day, until at the present moment the Western nations of Europe have as great a monopoly of Eastern trade as four hundred years ago the eastern portions of the Mediterranean enjoyed. Now, that is a great revolution, but the Portuguese Secretary, in his admirably expressed speech, pointed out that Vasco da Gama did much not only for commerce, but for Christianity. In an indirect way I believe this discovery had a great effect upon the conflict that was then going on between Mohammedanism and Christianity in the eastern part of Europe and in certain parts of Asia and in Africa. The Mohammedan advance seemed irresistible, and one of the reasons, I believe, was that they had the monopoly of all these trade routes, and having that monopoly they were able to largely increase their sinews of war. But by the knowledge that there was a sea-route round the south of Africa, a gradual diversion of that trade took place; the sea-carrying power of the Eastern states in the Mediterranean to a considerable extent decreased; and when, some seventy years after, at the great battle of Lepanto, the Mohammedan naval supremacy in the Mediterranean was destroyed, I believe Vasco da Gama, seventy years previously, did as much to contribute to that defeat as the victorious fleet itself. And if I turn to the Government on whose behalf I am speaking—the Government of India—I think I may say that the revolution which this discovery made was greater in India than in any other part of the world. For from time immemorial India had been the prey of a conqueror, but the conqueror had always come from the north; it was from the plateaus of the high ranges of India that century after century hordes of savage mountaineers devastated the country, and destroyed those with whom they came into contact. But under the happy auspices of the discovery which we are celebrating to-night, a kindlier era of invasion was inaugurated in India. The white man came from the south, and with him brought the blessings of stable government, and various European nations have been able to establish throughout India a system of rule and of dominion by which the civilized races there have greatly benefited, and have increased both in numbers and prosperity. If, Mr. President, we may congratulate ourselves that in India we have got the lion's share of that dominion, let it never by Englishmen be forgotten that it was to a Portuguese that we owe the discovery of a course of communication between India and Great Britain, and that it was through a Portuguese princess, the wife of Charles II., who brought us her dowry possessions on the western coast of India, that we got our first hold by which we have built up that system of dominion and administration of which we are so proud. And therefore, looking back to the past, it does seem to me that we have much for which we should be grateful to Portugal, and I heartily echo the concluding and eloquent words of your President's speech—that a sense of those benefits which we have derived from Portugal may establish between this country and that even kindlier relations than before, and that the future may be associated with the closest ties of amity between us and our old and much-trusted ally.

H.R.H. the Prince of Wales: Before we separate to-night, I am anxious to read to you two telegrams. I sent one this afternoon to the King of Portugal: "As we are to-day celebrating, at the Royal Geographical Society, the four hundredth anniversary of Vasco da Gama's great discovery, we send your Majesty our hearty congratulations on this important event." On entering these rooms to-night, I received the following answer from the King: "Portugal celebrates to-day the glorious date of the arrival of the great Vasco da Gama in India. We all thank your Royal Highness and the British nation for the honour you are doing us to-night at the Royal Geographical Society." I must express the pleasure it has given me and my son to be present on this interesting occasion, and I beg of the *chargé d'affaires* of Portugal, who has delivered such an excellent address to-night, to express to the King and the Government of his country, and to the Portuguese nation, how entirely we sympathize with him in everything that concerns the celebrations which are taking place this week. I believe, ladies and gentlemen, that Portugal has every reason to be proud of her expeditions of discovery which culminated in the voyage of Vasco da Gama round the Cape of Good Hope to India. I need not remind you that the great series of voyages which revealed to the world for the first time the real outline and extent of the continent of Africa, was initiated during the fifteenth century by Prince Henry the Navigator, whose mother was English, being the daughter of John of Gaunt. We in England have every reason to be grateful to Prince Henry and the Portuguese, for we have profited more than any other nation by those great discoveries. It is, therefore, most appropriate that we should meet to-night and join with Portugal in celebrating the fourth centenary of the voyage which has had such a marked effect on the history of the world in general, and of our own country in particular.

The President: I feel sure you will wish me to convey to His Royal Highness the Prince of Wales and His Royal Highness the Duke of York our sense of their kindness in coming here this evening. I am sure you will all agree with me that their presence has added very much to the interest, and, indeed, to the significance, of our commemoration of the achievement of Vasco da Gama.

THE 'ROTEIRO' OF DA GAMA'S VOYAGE.

In connection with the Vasco da Gama celebrations, Mr. Ravenstein has done a service to English readers by translating and editing for the Hakluyt Society the 'Roteiro,' or *Journal* of the first voyage to India, which is the only available account written by a member of the expedition. An English version of the three voyages of Da Gama, as described by Gaspar Correa in his 'Lendas da India,' had already been published some years ago by the Hakluyt Society, under the editorship of Lord Stanley of Alderley. But, as Mr. Ravenstein points out, Correa's account differs materially from all others which have come down to us, and if we accept it, we must reject the almost unanimous evidence of other writers of authority; while it is probable that Correa's long residence in India, some years after the date of the first voyage, prevented him from obtaining accurate information, such as would have been found in the Archives of Lisbon. The 'Roteiro,' now published for the first time in English, forms, in fact, the only contemporary account, with the exception of second-hand versions contained in letters written by King Manuel and Girolamo Sernigi (also reproduced by Mr. Ravenstein), and its value is therefore at once apparent. The manuscript, the substance of which was first given to the public in 1838 by the Portuguese edition of Prof. Kopke and Dr. A. da Costa Paiva, originally belonged to the Convent of Santa Cruz at Coimbra, whence it was transferred to the public library of Oporto. Internal evidence shows it to be, not the original journal, but a copy, the names of author and copyist being alike unknown. It was suggested by Prof. Kopke that the latter was the famous historian Castanheda, who appears to have depended, for his account of the first voyage, almost exclusively on the 'Roteiro;' but for this there is no valid evidence. Mr. Ravenstein also differs from Prof. Kopke as regards the opinion of the latter that the author must have been a common sailor or soldier, showing that he must at least have been a man of judgment, and equal in literary ability to many men holding high position in those days. A process of elimination removes all but eight of the names of those known to have accompanied Da Gama from the claim to the authorship, but there is no proof that the author's name occurs in any account we possess. The text of the 'Roteiro' is fully elucidated by footnotes, and Mr. Ravenstein has evidently spared no pains in the endeavour to make the edition useful to his readers. His wide knowledge of the history of geographical exploration, and especially of all that has been written abroad on the subject of the voyage in question, renders the book one of the most valuable of those issued by the Hakluyt Society. It is abundantly illustrated by portraits, maps, and facsimiles bearing on its subject, and information of much value on various points is given in appendices.

That dealing with the early maps, on which the results of the Portuguese voyages were shown, deserves special mention, a useful feature being the reproduction of portions of Cantino's and Canerio's charts of 1502, as well as of an anonymous map, probably of the same date, in the possession of Dr. Hamy. Although portions of Canerio's map have been reproduced in more than one collection, we believe that the Asiatic section has never previously been published.

THE GEOGRAPHY AND RESOURCES OF THE YUKON BASIN.*

By WILLIAM OGILVIE, of the Topographical Survey of Canada.

AFTER the kind things that have been expressed towards myself by the President, and endorsed by you, I feel somewhat put out. I feel that I cannot conscientiously apply them all to myself; I will therefore accept them as being offered me as the representative of the country whence I come, a country that I am proud to tell you is more British, perhaps, than any other part of this vast empire. A few years ago, perhaps a generation ago, that feeling was not exhibited to the same extent that it is now. Then it might have been compared to a small stream gently meandering through the land, and affecting all that it came in contact with; now it is a resistless torrent sweeping everything out of its way, and permeating the whole of the country with a thoroughly British feeling, and making us take a pride in being part of the British Empire, and glorying in the history and traditions of the British Empire, a much as you who are listening to me.

There is a common saying that blood is thicker than water. So it is; but there is a substance that, unfortunately, many people consider much thicker than blood and much heavier than water, that is, gold. I have come to speak a short time this evening on that subject in connection with the Yukon district, and to do so, I shall have to deal first of all at some length with the geography of the Yukon basin. I hope I shall not weary you, but it will take me some time to get through, because it is a very long river, so long that you might wrap it round this little island, and then tie a knot with the ends. After that I will make a few remarks about the gold deposits, their extent and probable development; after that, a few remarks on the habits and customs of the people; and then on the weather, and I would recommend you all to put on your wraps before I read the temperatures that have been observed there. Then I have some fifty odd slides to show you, exhibiting the surface features of the country from the head of the Yukon to its mouth, and these pictures will show you better than any word-pictures of mine, the surface of the country.

The map shows you Alaska proper. The dotted line is the 141st meridian west of Greenwich. It is the international boundary-lin between Canada and Alaska. My first visit to the country was made i order to determine where that meridian crossed the Yukon river, and i connection with this I made a survey from the head of the Chilka inlet, across the mountains to the lakes at the head of the Lewes river and down that river to the boundary.

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* Read at the Royal Geographical Society, March 23, 1898. Map, p. 112.

Now we will begin at the Dyea pass, taking the Lewes branch first afterwards the Teslin river, and then the Pelly. Beginning at tid water on Dyea pass, we make our way about 8 miles up the valley o Dyea river over the moraine of an ancient glacier; then we have abou

LOOKING NORTHWARD AND LANDWARD FROM PENINSULA BETWEEN CHILKAT AND CHILKOOT INLETS.

(*Photo by J. J. McArthur, D.L. Surveyor.*)

3½ miles to make our way through woods, where there is now a roa cut, to Sheep camp, about 1000 feet above sea; from there to th summit, about 3 miles, we ascend 2600 feet. No part of it is very stee until you get near the summit, when there is about 500 feet whic has a slope of from 35° to 40°. The first time I walked over, carried my chronometer in one hand, a magnetic dip-circle in the othe a barometer on my back, and some other instruments of less importanc You have, no doubt, seen this pass pictured as being almost perpendicula at some points. I have not seen those places yet, and I have gone ove several times. Down to Lake Lindeman we descend 1350 feet, an travel 8½ miles from the summit. Lake Lindeman is about 4½ miles long. We descend it, and then cross a sandy ridge, a little less than a mile, to Lake Bennett, which brings us to the head of the navigable waters of the Lewes branch of the Yukon river. Lake Bennett is 25½ miles in length; midway there is a branch which strikes off to the south-west, which is about 14 or 15 miles long; heading in some of the glaciers of the coast range. At the foot of Lake Bennett we reach what is called Cariboo crossing; it is about 2½ miles long, and out of it we go into Tagish lake, 17 miles in length. At the foot of this there are 5 miles of a small river, averaging 100 yards in width, and from 6 to 12 feet deep. Passing it, we arrive at Marsh lake, 19 miles long, with good water all the way through. At the foot we strike the river proper, and go down it 25½ miles to the cañon. The cañon is about 70 to 90 feet wide. The walls are of basaltic rock, and about as high as it is wide. The stream is so swift that you run through it, ⅝ of a mile, in about three minutes. At the foot is a rather rough rapid, and after running through a pond-like expanse in the river below this rapid, you make a sharp turn to the left, and then to the right, and that brings you to the White Horse rapid, which is the only dangerous spot in the river. A great many have run through it safely, but many have lost their lives there; I traced thirteen deaths by drowning in 1895 at this point. Fourteen and a half miles below the White Horse a river joins, called

LOOKING NORTH-WESTWARD ACROSS DYEA AND CHILKOOT INLETS.
(*Photo by J. J. McArthur, D.L. Surveyor.*)

Takhina, or in English, Mosquito river. This joins from the west, and flows out of a large lake about 30 miles above its mouth. Thirteen and a half miles below that we reach Lake Labarge, the largest lake on the river, 31½ miles long. Out of that we make our way down what is known to the miners as the Thirty-mile river to the mouth of the Teslin. Most of that reach of 31 miles is a very rapid current, and there are several big rocks in various places; but they are not formidable, because they are easily seen, and you can avoid them.

Now we will go back to the coast, and go over the much-discussed Teslin route. The Stickine river has been navigated by boats for over twenty years. There is a small steamboat which plies up that river to Telegraph creek, about 150 miles, every year making several runs. In 1896 and 1897 the Hudson Bay Company's steamer *Caledonia* made four trips from Port Simpson up through the coast tidal rivers to the mouth of the river—two in '96 and two in '97. These voyages were made in the best season of the year, no doubt, when there was plenty of water in the river; but I do not think there is any doubt whatever but that that river can be navigated by light-draught stern-wheel steamers during open water—that is, from the middle of May to the middle of November. It is said, and it has been discussed very much at length, that trouble will be raised at Wrangell over the transfer of cargo from the ships to the boats. If it is, we can unload at Simpson, in British territory, the only objection to this being that you have to cross Dixon's entrance in a river steamer, and a strong wind makes it too rough, and such boats would have to abide the event of the weather for departure from and return to that port. With this probable detention, we can ply from a British port to a British port, and the only part of foreign territory that we have to traverse is the coast strip which the Americans claim—is 34 miles in width, which width we do not admit. It is 170 miles from Simpson to Wrangell in ocean water, and from Wrangell to Telegraph creek 150 miles on the Stikine river. From Telegraph creek overland to Teslin lake is about 150 miles of tolerably easy country—that is, when you compare it with the rest of that country, which is very mountainous. It would not be called easy here; nevertheless, by next autumn the probabilities are we shall have a railroad from Telegraph creek to Teslin lake. Now, the lake was surveyed last fall by one of our surveyors, Mr. St. Cyr, and my son. It is 65 miles in length, and from ½ to 2 miles in width, and from the foot of the lake down the Teslin river (known to the miners as the Hootalinqua) is 135 miles to the junction with the Lewes. From there we continue 36½ miles to Big Salmon river, which is an unimportant stream, only of note in the sense that gold has been found all along it, not in large quantities, but still it is there. It has been explored up to Quiet lake, an estimated distance of 200 miles, and the lake is reported 24 miles long, but it is probable this is much in excess of the true distances. From Big Salmon river to Little Salmon river is about 36 miles, and from there to Nordenskiöld river is about 29 miles.

We will now go back again and take the Dalton trail, beginning at the mouth of the Chilkat river, and going up it to its confluence with the Klehini river, joining from the west, up which we go some distance; and then take overland over a succession of low passes, said to be about 3000 feet above sea-level. Ninety-five miles from the coast you strike the summit proper—that is, the summit of the watershed between the Alsek river and the streams flowing into Chilkat inlet—and from there you have an easy undulating country to traverse until you strike the Lewes river near the mouth of the Nordenskiöld river, some 130 miles below Teslin river. A short distance below the Nordenskiöld is the principal obstruction in the river—that is, when we descend by the Teslin branch—known to the miners as the Five Finger Rapids, and to the coast Indians as the Yeth Katzi, or the Raven islands, because there are five masses of rock or islands standing in the channel, on which those birds nest. The river has worn its way through a barrier of conglomerate rock, part of which now remains on both sides, and left these five masses standing in the stream. The ravens make their nests there because they are protected from the depredations of animals. The local or Tagish Indians call them Chi Cho, or big

LOOKING DOWN CAÑON FROM HEAD.

rocks. From the Five Fingers down to the mouth of the Pelly is about 57 miles, or 375 miles from the head of Bennett lake, by way of the Dyea or White pass, and through the cañon, White Horse, and Five Fingers. To the Pelly by way of the Teslin route is 387 miles from the head of Teslin lake, with only one hindrance to easy navigation—the Five Fingers. With these interruptions both those routes are easily navigable; the first from the head of Bennett lake, the last from the head of Teslin lake.

The Five Finger rapids are not more than a detention, for any ordinary river steamer can ascend them with the aid of a line, or warping, as it is termed. A line is fastened to some point on the shore ahead, and the boat helps to pull herself up by hauling on this line with her steam capstan or winch. The detention is caused by the water being dammed by the rocks mentioned. This raises it somewhat, and there is a short plunge of from 1 to 2 feet down to the level below. This plunge does not extend over more than a score of yards. Both above the rapids and below there are several miles of strong current, but not enough to prevent steamers ascending it; and once past this, there is no trouble up to the head of Lake Teslin by the Teslin route, or up to the White Horse rapids on the Lewes, 220 miles above Five Fingers and 97 below the head of Bennett lake.

LOOKING DOWN "WHITE HORSE" RAPIDS.

Now, the Pelly was examined and surveyed by Dr. Dawson in 1887, the same year that I made the instrumental survey of the Lewes. He made his way up the Stickine, across to Dease lake, and down the lake and the river of the same name to the Liard river, up which he went to Frances river, ascended it and the lake of the same name, and crossed the watershed of the Liard and Pelly to a point on the latter in 61° 49′ N. lat. and 131° 31′ W. long. From this point he made a survey down the Pelly to its mouth, 320 miles.

From the mouth up he reports it navigable for river steamers to Granite cañon, 61 miles up. This cañon is about 4 miles in length, and a steamer might have difficulty in ascending it owing to crooks, but he thinks by warping she would succeed. Nine miles above the cañon the Macmillan river joins from the north-east. Above the cañon the doctor is of opinion that a smaller or lighter draught boat could ply up the Pelly to Ross river, about 250 miles above the junction with the Lewes; and probably the same steamer could ascend the Macmillan 40 or 50 miles.

BIRD'S-EYE VIEW OF SITE OF "DAWSON" AT MOUTH OF KLONDIKE, APRIL, 1897.

From Fort Selkirk, or what was Fort Selkirk, the old Hudson Bay trading post a mile below the mouth of the Pelly, down to White river is 96 miles. White river joins the Yukon from the west, and a great part of it is in our own territory, but much of the head is in Alaska. This river branches some 25 or 30 miles above the mouth, and the north branch heads close to Sixty-mile and Forty-mile rivers. The other branch is reported to head in a very large lake north-east of Mount St. Elias, named Kluahne lake. Another branch is reported to head south-west of this in another large lake. Copper is reported on the upper stretches of this river, but has not been located yet. Ten miles below White river, Stewart river joins from the east. It is reported to be navigable for light-draft steamers up to the falls, about 150 miles, as near as I can ascertain from the reports of miners. One or two of the branches of this stream may afford another 100 miles of navigable water for the same class of steamers. One of them heads in a lake called Mayo lake, reported about 25 miles in length, but narrow. From the Stewart to Dawson is 69 miles, all good navigable water. From Dawson to the boundary-line is about 90 miles, all of which is good too. From the boundary-line down to the Yukon flats, about 130 miles, at the head of which is situated the Alaskan mining town Circle City; the navigation is good, but in the flats it is often bad, especially in low water. These flats extend nearly 100 miles, and were at one time the bed of an extensive lake, now filled with innumerable islands and channels; most of those channels are impassable for boats, and those channels that are passable are continually changing. In 1895 the record season was accomplished, that is, one of the steamers made five trips from the mouth of the river to Forty-mile, which was then the highest point on the river at which trade was done, estimated to be about 1500 miles above the mouth. In 1896 the same boat made four trips; in 1897 some only two, and some three. The trouble was, the water fell so rapidly in August, that in the steamboat channel there were only 22 inches of water. The result was they lay there from the middle of August until October, and some are still in that vicinity. Two of them got up with very light loads to Dawson, and the non-arrival of the others was the cause of the threatened starvation there, which I am happy to say was nearly altogether baseless; there never was any serious fear of extensive starvation. After getting through the flats, we make our way down the river without any trouble until we get some 900 or 1000 miles farther down, where the river begins to spread out again, and often there is difficulty, on account of the many different channels; and when you get into the delta you have much trouble again. The channel generally used is narrow, crooked, and shallow, and boats often ground in it. The boat I came down on lay on a bar in the mouth of the river a day before she could get off. Then we were three days outside a mile or two at anchor before we could cross Berings sea to St. Michael's, which is some 72 miles off.

Now let me recapitulate. From the head of Lake Bennett on the Lewes branch to the cañon, 95 miles, all easily and safely navigable. The cañon and adjacent rapids, 2½ miles long, absolutely impassable for steamers; and from the foot of those rapids to the mouth of the Teslin, 90½ miles, some of which is strong current, but not impassable, and Lake Labarge, which might prove too rough at times for boats light enough for the river. From the head of Teslin lake, by the Teslin route, to the foot is 65 miles, and this lake too might at times prove too rough for light river boats, but it is not so wide as the other lake (Labarge) on the Lewes; besides, Teslin lake is more crooked, and thus affords more shelter from rough water then Labarge. From the foot of Teslin lake to Lewes river, following the course of Teslin river, is 135 miles, all easily navigable. From the junction of those two streams to the Five Finger rapids, 129 miles, is all easily navigable, and, as has been already intimated, those rapids are not serious. From the rapids down to the Pelly is 58½ miles of good river. On the Pelly, as already stated, we have 60 miles of ordinary steamboat course, and probably 220 to 250 more for smaller steamers, with no break in its continuity.

LOOKING UP YUKON RIVER FROM NEAR DAWSON, 1870 FEET ABOVE RIVER, APRIL, 1897.

From Pelly to White river, 96 miles, all good; the heaviest steamers now on the river have made several runs over it. Between White and Stewart rivers, 10 miles, there are no hindrances to the boats now navigating the Yukon. It is doubtful if the White can be navigated at all by steamers, as it is very shallow and swift at the mouth. Stewart, as already intimated, is navigable for about 150 miles by light-draught steamers, and some of its affluents will possibly afford 50 to 100 more. Between Stewart river and the International boundary-line, 158½ miles, no stream of importance joins. Summing this, we get

636½ miles of navigable water on the Lewes branch, exclusive of the cañon rapids, which are insuperable; 200 on the Teslin, about 300 on the Pelly and branches, and 200 on the Stewart. In all 1336½ miles, of which over 1200 we know to be navigable. From the boundary to the mouth is estimated at 1487 miles; it is all navigable with some difficulty at points as already stated. The Porcupine, about 210 miles below the boundary, will likely afford about 400 more miles of navigable water. It does not appear that the Tanana, the only other large stream joining the Yukon, is navigable any distance, but further examination may modify the reports so far received.

All this gives us over 3200 miles of fair navigation in the system of the Yukon river, of which Canada owns nearly 42 per cent. Taking the accompanying map, with those streams as they are marked on it, we have the Lewes branch and Yukon running from 59° 46′ N. lat. and 135° 13′ W. long., in a north-westerly direction for about 900 miles. It then makes a sharp turn to the left, running nearly west for about 720 miles, when it turns nearly south for about 265 miles, and then north-west again for about 230 miles, in all about 2100 miles in length. One remarkable feature in connection with this river is that it drains the interior of the peninsula of Alaska, and nearly cuts it in two, starting as it does less than 14 miles as the crow flies from the waters of the Pacific ocean at the extreme head of the Lewes branch, whence it flows 2100 miles in the manner indicated into the same ocean again, or Bering sea, which is a part of it. Now take the map attached to this paper, and with the watershed marked as we there have it—which is only approximate, because the streams are not all surveyed—and we find that the drainage basin of the river occupies about 338,000 square miles; Canada owns 149,000 of that, nearly a half, and of the river she owns less than a third, but that is much the most important part of the Yukon drainage basin. It contains the most wealth, as I hope to point out to you later on.

Now a few remarks on the gold-bearing area. The first location of gold, and the first gold bars that were worked to any extent, were on the Stewart, about 30 miles from the mouth. There was another place on the Lewes, midway between Teslin and the Big Salmon, known as Cassiar Bar, which paid well. Many other points along the Lewes also afforded good pay, and were worked for several seasons, until the discovery of coarse gold on Forty-mile river in 1886, which, becoming known, drew all the miners in the country to it. Coarse gold was discovered on Birch creek in 1891, which in 1892 originated Circle City in Alaska. In 1896 gold was discovered on Bonanza creek, a tributary of Troandik (commonly known as and called Klondike). The first name is the correct Indian one, and means Hammer creek, from the fact that they used to erect barriers across the mouth to catch salmon by hammering sticks into the ground.

By the way, I forgot, in the proper place, to mention the probable origin of the name "Yukon." The Indians along the middle stretches of the river all speak the same language, and they call the river the Yukonah, which in English is "the great river," or, in short, "the river," because it is the only river they know. Our Indians in the vicinity of Forty-mile call it "The-tuh." What that means I cannot tell you, and they laughed at my simplicity for asking when I tried to find out.

Gold was discovered on Bonanza creek, August 16, 1896; that led to the discovery and development of the celebrated Klondike region. Gold has been found on the Stewart up to the head. One man, Alexander Macdonald, prospected this river all the way up in 1886, and remained in that region alone during two different seasons. During the summer of 1887 he crossed to the headwaters of what is evidently a branch of the Peel, and prospected it for some distance down, and found gold in the gravel as far as he went; and in 1873, Mr. Arthur Harper, the pioneer prospector of the Yukon, found gold in the sands and gravels at the mouth of the Peel, which corroborates Macdonald's statement, for the geological formations near the mouth preclude the idea of gold there other than what has drifted down the river. From this we infer that a considerable portion of the upper Peel is also in the auriferous area. Several parties leaving Canada

LOOKING ACROSS BONANZA AND UP ELDORADO CREEKS, APRIL, 1897.

this season are determined to test this, and I have no doubt but that it will be investigated ere many months.

Gold is also found on the Pelly. Miners have been prospecting there for years, but never got a great deal, though they generally got enough to keep them in supplies for a year. Big Salmon river was also found to be gold-bearing over its whole length. The Teslin river was prospected in 1886–7, and in some places very good indications found. I found gold on the Lewes when I went in 1887, up near Lake Labarge; I also found gold in the drift, well up on Bennett lake—very little, it is true, but enough to swear by. The celebrated Cassair district is south of the head of the Teslin, which was worked in the seventies. Along the head of the Liard river gold is known to exist. At Dalton's crossing of the upper Alsek or Tatshenshini river gold was discovered in 1896, by a man who was fording the stream on horseback; the brute stumbled and threw him into the water. Scrambling ashore through the icy water as fast as he could, he seized a small bush to help him up; it came away by the roots. The clay which came with it was washed in the rapid current, and he saw something bright, which he picked up and found to be gold. This he exhibited at Forty-mile on his arrival there some months after. Fine gold is also reported at a couple of points midway between this point and Selkirk, along the Dalton route, which is laid down on the accompanying map. Harper,

JUNCTION OF YUKON AND FORTY-MILE RIVERS, WITH TOWN OF FORTY-MILE BETWEEN.

the pioneer already referred to, found light prospects along the White river, both branches of which he ascended some distance; but he was in quest of copper, which is often brought in by Indians from this vicinity, and did not pay strict attention to gold. The exact locality where they get the copper is yet unknown, but frequently they bring to the trading post quite large specimens of pure native copper, which they say they find along this river. Harper searched for and found some indications, but did not locate it.

Gold has been found on the coast at several points, notably at Juneau, in Alaska; at Ruby Sands near Lituya bay, about 50 miles west of Cross sound, shown on the accompanying map, and south of the point where it was found on the Tatshenshini river about 100 miles. It is also found at other points further west along the coast, and we generally find it at points north of those places in the interior, from which we infer, with reason, that all the part of the Dominion north of British Columbia and west of the Yukon-Mackenzie watershed, except that part north of where the Yukon intersects the 141st meridian, is gold-bearing. Much of it, no doubt, is not rich, some of it we know is, and very much will pay well with better facilities for working.

CONFLUENCE OF FORTY-MILE RIVER WITH YUKON, LOOKING UP BOTH STREAMS. YUKON 600 YARDS WIDE.

Now as to its richness. The richest part is Trondik, better known as Klondike. On Bonanza creek, a branch of the Trondik, there are some two hundred claims, each 500 feet in length. I have no hesitation in saying that the middle hundred of these claims, that is, from about No. 60 below Discovery claim to No. 43 above Discovery, will turn out—

unless a very curious coincidence has occurred, and that is that every man has struck the only rich part in his claim, which is highly improbable—unless that is the case, I have no hesitation in saying that those claims will turn out £5,000,000. On a branch of the Bonanza—Eldorado creek—some eighty-six claims have been marked out, fifty of which I made a survey of. Forty of these were known last season to be good, and unless the indications are highly misleading, and the same coincidence has occurred again, each of those claims contains on an average 1,000,000 dollars, or £200,000. With the same indications in view, I have no hesitation in saying that those two creeks will turn out, before they are exhausted, 75,000,000 dollars, or £15,000,000. Take this little area drained by the Klondike—on one side only—and a part of Indian creek basin, about 35 miles in length, and less than 25 in breadth, unless the same coincidence has occurred again, we have 100,000,000 dollars, or £20,000,000 worth of gold in sight, and probably twice that amount before it is exhausted. On Forty-mile and on Sixty-mile, gold is found in abundance. Two of the tributaries of Sixty-mile river, Miller creek, and Glacier creek, are each about 5 miles in length, thus affording about fifty claims apiece, some of which have netted comfortable fortunes to a good many men. One claim netted in two years 70,000 dollars, or say £14,000. The owner then gave it away, and the man on whom he bestowed it is now taking a small fortune out of it. On one of the bars on Stewart river, four men took 6000 dollars (£1200) in less than a month. On the Pelly only fair wages have so far been made. Of the Teslin, we may say it is better than the Pelly, but not so good as the Stewart. In some cases, from 10 to 12 dollars, that is, from £2 to £2 10*s*., have been made per day on its bars, and this holds good along its entire length, if report speaks truth. On the Stewart, Pelly, and Teslin, little or no prospecting has been done off the main streams, and on all the other known rich auriferous areas, it is in the smaller streams and gulches the most wealth is found.

Now, all these indications point pretty conclusively to this fact: Canada has, exclusive of the province of British Columbia, in which doubtless very much mineral wealth will be found, an area bounded on the west by the 141st meridian, on the south by the 60th parallel of latitude, and on the north and east by the summit dividing the basins of the Mackenzie and Yukon rivers, comprising upwards of 125,000 square miles, over nearly all of which we find gold in more or less abundance. This area contains approximately 7000 linear miles of river, stream, and gulch, of which we are fairly certain at least one-half is auriferous. It must be borne in mind that those miles are only *linear miles*, along which the auriferous area will not average more than 500 to 1000 feet in width. Of the half of this, or, better still, say 3000, which we can safely assume gold-bearing, only about 200 were fully tested and developed up to

August last, and at present date probably not more than 400 have been fairly well tested.

Now, while we cannot assert positively that any more Klondikes will be found, we cannot say there will not, and we can look forward with reasonable certainty to much valuable ground being found. What we know now to be rich will take several years to exhaust, and before that time, in all probability, we shall have discovered much more.

With reference to auriferous rock, a few words. There is not time now to theorize, so I will only give a few facts. The first location of gold-bearing rock in the Yukon district was made near the town of Forty-mile, on a hill known as Cone hill. This is a veritable mountain of auriferous rock of low grade. Several tons of it have been assayed, with the result that it shows from 12*s.* or 15*s.* to 44*s.* per ton of rock, the average being about 24*s.*, or nearly 7 pennyweights. Two or three claims have been located here 1500 feet long by 600 wide, the maximum legal limit for quartz claims. Soon after, two more lodes were located opposite to where Dawson now is, but they are not extensive, though said to be richer. Up the Trondik a short distance another very extensive exposure has been discovered of low grade ore, and further up still another has been discovered which assays from 100 dollars (or £20) to 1000 dollars (or £200) to the ton.

LOOKING UP CAÑON ON FORTY-MILE RIVER 8 MILES ABOVE MOUTH.

The only difficulty about this is, we do not know the extent of it; there is no development work done, and the exposure is very small, so we cannot say whether it is as good as the others, which are more extensive, though lower grade; in fact, we cannot say it is worth developing.

Still farther up the same river another claim has been located, of which it is alleged it is very extensive, and fairly good. I can give no figures. About 20 miles below Dawson two more claims have been staked on what is stated to be one of the largest lodes in the world, and assaying an average of 28*s.* to 32*s.* per ton, or 8 to 9 pennyweights.

Two or three others of less importance have been discovered and located, but, as far as I know, with the exception of the doubtful one mentioned, none very rich have yet been found. But I have no doubt that improved transport facilities and improved methods of mining low-grade rocks will yet render these important and valuable.

On Lake Bennett I have picked up specimens of gold-bearing rock that have assayed very small quantities, hardly worth mentioning, but it shows it is there. The same remark can be made of many other places, needless to mention now. Miners speak very hopefully of quartz discovery on the Stewart river. They say that the rock at the head of its waters looks very well, but they have not brought in anything to show what it is worth. Heretofore there has been no chance of developing any of this property, the freight on mining machinery would often cost two or three times the worth of the machinery itself. You have to take it from some point on the coast some 3000 miles to St. Michael's, and then some 1600 or 1700 miles or more up the river, which makes it cost from 125 to 130 dollars per ton, and heretofore the transport facilities there have been altogether inadequate to keep up the proper supply of provisions. Year after year many of the men who have gone there had to come back in order to live over the winter, owing to the dearth of provisions. As soon as the Teslin road is finished, that trouble will be wiped out. On Forty-mile river there are deposits of galena carrying silver as high as 34 ounces to the ton. A line drawn from near Dawson, down the valley of the Yukon, to within a short distance of Forty-mile, shows indications of copper all along.

From the vicinity of the boundary on the river, a high range of mountains of cretaceous limestone runs in a south-easterly direction for more than 100 miles. It is much the highest and best-defined range in that part of the country, and, as far as I have seen, in the Yukon valley. Along the westerly base of this range a deposit of very superior lignite coal is found, at some points very convenient to the river, and nowhere I have seen or heard of difficult to develop. When facilities are convenient for working the quartz before mentioned, the necessary fuel will not be far to seek.

Now I will tell you something of the timber resources of the country. Beginning at the head of Lake Bennett, you have scrub timber, pine (or spruce), and poplar, as it is known in that country. I won't give you botanical names, as it is only wasting time. The trees are small and scrubby, generally useless for anything but firing. By long and extensive searches you may find a tree here and there suitable for making boats, such as are used on the river—that is, large enough to yield planks 6 or 8 inches wide. As you get to the foot of this lake, the timber increases in size; but the number of fair-sized trees, that is, from 8 to 12 inches diameter, is very limited. At the foot of Lake Marsh, the timber is really of service and valuable. But the only place you find it is adjacent to the river; away from the river, 100 or 200 yards, you can only find small scrubby trees that are growing on eternally frozen ground through a thick layer of moss, and the result is you will see many trees 2 or 3 inches in diameter, that are probably two or three centuries old. As you go up the hillside it gets thinner, until at an altitude of 1500 or 2000 feet above the river, you are out of the timber altogether, on the bare rock of the mountain-top. That condition holds until you get down to the Yukon flats, when the timber begins to thin and gets smaller and thinner, until you get to within 300 or 400 miles of the mouth, where there is no timber at all. It is simply shrubby, and from there the steamers have to depend on the driftwood, brought down the river annually from above. Take the best part of this timber area, and trees 15 or 18 inches in diameter are scarce, and you seldom

LOOKING NORTH ACROSS YUKON RIVER AT 141st MERIDIAN OR INTERNATIONAL BOUNDARY-LINE, DECEMBER, 1895.

find one 20 inches. At the boundary, when I wanted to erect my transit, I wanted a tree 22 inches, and after a three days' search by five men over a radius of 2 miles, the largest tree we found was only 18 inches in diameter at 3 feet above ground.

Now as to its agricultural value. A pamphlet was issued by the Director of the Central Experimental Farm at Ottawa not long ago, on the agricultural possibilities of the Yukon district. One of our newspapers, in a review of it, said that the director had issued a pamphlet on the agricultural possibilities of the Yukon, the most characteristic feature of which was, that the Yukon district seemed to have no agricultural possibilities at all. At one or two points attempts have been made to grow vegetables, but with limited success. Mr. Harper, who resided at Pelly since 1891, had a garden, in which he grew some very poor potatoes and other garden stuff. What succeeded best was lettuce. To protect them at night when the sky was clear and frost threatened, he lowered an immense awning over them, raising it in the morning after the plants had recovered from the effects of the cold. At Forty-mile they have several gardens in which they grow a very fair potato, but it is not dry, and not at all well tasting. They also grow good lettuce and small cabbages, which is very much relished, because it is the only vegetable supply there, and at present you cannot import any. This shows conclusively one need not count on anything in the way of agriculture as food-supply; for two reasons, the extent of available soil is very limited in comparison with the rest of the country, and it might be said frosts occur every month in the year. Close to the river, the temperature of the water from June to September runs from about 46° to 56° or 58°. Of course, the proximity of a large body of water at those temperatures considerably aids vegetable life and helps its development close to the river, because it moderates the adjacent temperatures. But away from the river a mile or so, you have serious frosts every month in the year.

The ice in the river breaks up generally about the middle of May. After breaking it runs very thickly for two or three days, when it begins to thin out and flow less and less, until at the end of a week it is clear enough for steamers, though small boats could navigate it sooner, especially if going down. There are only about three and a half months in the year during which you can go to St. Michael, for the reason that Bering sea does not open much earlier than July 1, and the river closes middle of October. In 1896 it was July 7 before the steamer could approach St. Michael. Ice freezes on the river to a thickness of 4 feet and upwards, and it takes a great deal of force to break it, and when it does break it drives for long distances in big cakes, and the river is so jammed with it that it is one of the most terrific exhibitions of force to see the Yukon river a few hours after the ice breaks. Often it stops altogether by jamming

METEOROLOGICAL RECORD IN THE YUKON DISTRICT.

Year.	Month.	Temperature.				Number of Times.								Remarks.
		Mean minimum.	Mean maximum.	Highest.	Lowest.	32° and below.	Zero and below.	−10° and below.	−20° and below.	−30° and below.	−40° and below.	−50° and below.	−60° and below.	
		°	°	°	°	.								
1887	Aug.	39·9	—	—	21·6	4	—	—	—	—	—	—	—	
,,	Sept.	31·7	—	—	16·0	18	—	—	—	—	—	—	—	First snow on the 23rd.
,,	Oct.	18·5	—	—	4·0	31	—	—	—	—	—	—	—	First ice running in river on 21st.
,,	Nov.	− 5·1	—	—	−24·1	30	22	12	3	—	—	—	—	Ice set in river on the 15th.
,,	Dec.	−33·6	−27·6	10·5	−55·1	31	31	29	26	19	14	4	—	
1888	Jan.	−25·3	−15·3	13·0	−53·5	31	27	23	19	16	7	3	—	
,,	Feb.	−16·8	− 4·3	24·2	−52·7	29	24	17	11	7	6	1	—	No readings were taken on 3rd, 4th, 6th, 7th, and 8th.
,,	March	−11·5	—	—	−52·7	26	19	13	6	5	4	1	—	,, ,, 11th.
,,	April	−20·4	—	—	−37·7	29	28	23	13	7	—	—	—	Max. temp. was not taken on the 3rd.
,,	May	19·8	43·3	55·0	− 1·8	30	1	—	—	—	—	—	—	
1895	Aug.	40·1	—	—	28·0	6	—	—	—	—	—	—	—	No readings were taken from 1st to 9th.
,,	Sept.	30·9	—	—	21·5	15	—	—	—	—	—	—	—	
,,	Oct.	19·4	—	—	−12·7	29	1	1	—	—	—	—	—	
,,	Nov.	4·2	11·9	38·5	−36·3	30	12	3	1	1	—	—	—	Ice set in river on November 22.
,,	Dec.	−18·2	−13·8	6·0	−55·4	31	29	20	10	6	3	1	—	
1896	Jan.	−41·9	−33·0	6·0	−67·9	31	31	29	25	24	15	12	5	
,,	Feb.	−25·5	−11·6	32·0	−64·8	29	27	24	16	11	10	2	2	
,,	March	− 2·4	18·1	39·5	−37·3	31	20	6	3	1	—	—	—	
,,	April	2·0	24·0	49·0	−28·4	28	15	10	8	—	—	—	—	
,,	May	28·8	48·7	62·0	5·0	18	—	—	—	—	—	—	—	
,,	June	39·8	65·1	80·0	27·8	4	—	—	—	—	—	—	—	
,,	July	44·5	68·9	81·0	33·0	—	—	—	—	—	—	—	—	
,,	Aug.	42·1	62·6	76·0	27·2	2	—	—	—	—	—	—	—	
,,	Sept.	34·3	50·5	63·0	4·8	8	—	—	—	—	—	—	—	
,,	Oct.	20·2	32·9	51·0	− 1·0	27	2	—	—	—	—	—	—	
,,	Nov.	−14·7	− 6·0	22·5	−38·0	30	23	18	13	7	—	—	—	
,,	Dec.	−17·4	− 6·5	11·0	−44·5	31	28	19	11	7	2	—	—	
1897	Jan.	−24·0	−14·0	10·0	−55·6	31	27	21	16	13	9	6	—	No readings were taken for max. temp. on 6th, 7th, 8th.
,,	Feb.	−12·3	0·6	31·0	−36·0	28	23	14	9	2	—	—	—	No readings were taken for max. temp. upon 16 days.
,,	March	−14·7	—	—	−54·3	30	21	15	12	8	5	3	—	,, ,, on the 28th.
,,	April	18·1	—	—	− 5·0	27	1	—	—	—	—	—	—	,, ,, ,, 4th and 5th.

in some sharp bend; the waters are dammed, rise, and when sufficient height is attained it breaks away again, leaving vast piles of ice along the banks, which are not melted away for more than a month. The upper part of the river opens sooner than the lower, but generally it may be said the whole river is open to navigation about June 1. Ice begins to form again in the river about the middle of October, and continues to accumulate until about the first quarter of November, when it sets, and the river is covered with ice—not smooth as we see it in more southerly latitudes, but rough and broken to such a degree that travel over it is in most parts impossible until the winter storms have drifted the snow into the spaces between the blocks of broken ice. Then travel is possible, but often very tedious and laborious. Each of the three winters I spent in the country accumulated about the same amount of snowfall, averaging nearly 3 feet. It is needless to say no melting occurs between October and April, with the exception of a very little in March in well-sheltered spots facing the south, but, as this is only local, it does not affect the general mass in any appreciable way. The snowfall is pretty evenly distributed over the seven months, October to April inclusive; but, as far as my observations go for three years, there is a predominance in October, November, and February. June, July, and September appear to be the wettest months. June, July, August, and part of September are the growing months. The subjoined synopsis of my meteorological records will give an idea of the prevailing temperatures.

Before the lecture, the PRESIDENT said: The distinguished member of a topographical survey of Canada, who is with us this evening, has not now been heard of by this Society for the first time. You have known of his work for the last ten years, and I think it was in the year 1891 that the Council awarded him the Murchison Grant for his distinguished energy and ability in conducting the survey of the region which he is about to describe to us—the basins of the Mackenzie and of the Yukon. But this is the first time we have had the pleasure of welcoming him amongst us, and I feel sure that he will be cordially received by this meeting. I will now ask Mr. Ogilvie to deliver his address to you.

After the lecture, the PRESIDENT said: Does any one in the meeting wish to address us or ask any questions? If not, I will remark that this region of the Yukon and the Lower Mackenzie was almost entirely unknown before Mr. Ogilvie was sent there to survey it in 1887. I believe there were two Hudson Bay forts established there in about 1846, but they were afterwards abandoned, so that when Mr. Ogilvie began his examination of this country we may look upon it as having been practically entirely unknown. He has surveyed it, and several years ago gave us an interesting account of it. The greatest calamity that can happen to a country is a war. The next greatest calamity, in my opinion, to an inhabited country is the discovery of gold. But we must confess here that both the operations of war and the discovery of gold have always been a great advantage to geographical science. It has been so in the present instance. I doubt whether, if Klondike had not become so famous, we should have had the great advantage of the presence of Mr. Ogilvie with all his numerous photographs this evening, and I also doubt very much whether he would have had so large an audience. We have, I think, a great deal to thank him for. He has described to us the physical characteristics of the country in the most graphic way. He has shown us what its capabilities are as regards its minerals, and what its incapacities are as regards its vegetable productions. It appears, from what he has read to us about the temperatures, that this country is about the coldest in the world; for a registration of −67·9° is very rare. I myself served in the arctic regions, and we never registered lower than −50°. I believe the lowest ever registered was in Siberia, and this was lower than −68½°. Still, thermometers are liable to error, and I suspect you have found in the Klondike district about the coldest region in the world. Mr. Ogilvie has illustrated his address by a most interesting series of views, which have given us an admirable idea of the country he has described. Both for what he has told us, and for his remarkably interesting illustrations, I beg you to pass a very cordial vote of thanks to Mr. Ogilvie.

Mr. OGILVIE: I just wish to return my acknowledgment for your vote of thanks. I rather thought myself that I was a little dry on the subject. I have been troubled with a sore throat since I came to London, and it has bothered me a great deal this evening. I thank you for your attention and the patience you exhibited. I hope at some future date I shall be able to talk under better advantages, and show you other and perhaps better pictures—I won't say that, but just as good.

EXPLORATION IN THE YAFEI AND FADHLI COUNTRIES.*

By MRS. THEODORE BENT.

THE first place we went to last year (1896), when we left England, was the island of Sokotra, because, as we had made two attempts in 1894 and 1895 to penetrate the Mahri country and been foiled, my husband wished at least to visit a colony of the Mahri, or Mehri, and study their manners and customs as much as he could; though, of course, their circumstances and surroundings must necessarily differ much from those of the mother country. My husband wrote an article in the *Nineteenth Century* on that island while we were in Aden preparing for a journey into the Yafei country. Our preparations for this expedition were made under quite different, and much happier circumstances, to those which attended our last journey from Aden to the interior of Arabia, *i.e.* the Hadramut. We received every help that could be given us by General Cunningham, Colonel Hayes-Sadler, Captain Wadeson, and, indeed, every one from whom we asked assistance was most kind. We took with us only our servant Manthaios, the Greek who has travelled with us so many years; Musaben, an elderly man from the Aden troop, as jemadar or general manager of the soldiers and go-between generally; and three or four soldiers. No interpreter was necessary, I am glad to say, this time.

We left Sheikh Othman on February 28, 1897, for our nine hours' ride to Bir Mighar, sorry to have to make so long a journey the first day. At first we went past pretty gardens and villas, but soon left these traces of civilization behind us, and the way went through desert, sometimes sandy, sometimes bare, and sometimes with low bushes; now straight, and at others wending among sand-hills with cliffs to leeward. In some parts every trace of path was smothered by sand, and quicksands also must be warily avoided. We passed the ruins of an old town near Sheikh Othman, and 5 miles on, Imad, a wretched-looking collection of brushwood huts round a dar, or tower, still in English land. A few patches of ground had the sand scraped off into banks, and was awaiting rain to sow some crops for fodder, but looked as if they had been waiting a long time. This caravan road across the Abyan is very old; its monotony is inexpressible for the nine hours to Bir Mighar. At the sixth hour the road to Hawash goes off to the left. As we approach the well the signs of population increase, and there are a few scrubby acacias. There are two wells a mile apart; the further, where we encamped, was once protected by a fort, now in ruins. A few years ago a hundred Yafei surprised the Fadhli, and sacked the fort, which has not since been repaired. Many parties of travellers were gathering round this well for the night; one husband and wife who took alternate charge of a baby slung in a straw cradle and a goat; another pair with their household goods, baby, and many fowls on a camel, while they were each laden with more fowls.

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* Map, p. 112.

THE HAGHIER MOUNTAINS, FROM SUK, ISLAND OF SOKOTRA.

We passed a cold night, and were very tired; our things, having been packed on board the buggela we came from Sokotra in, were not in marching order. We only made a short journey of 6 miles next day past Al Khabt, which was just the same sort of place as Imad. We had to take a most circuitous route to reach it, and it was hard to realize that all the banks we wound amongst were fields waiting for rain.

Hagheri Ask was even a yet more wretched hamlet—about six reed huts, and about as many goats and jackal-like dogs.

Our tents were most unsteadily pitched on sand. There is a good well, and there has been a village here "from the first," as the Arabs say. There are many traces of antiquity; and many pieces of glass, good pottery, and bangles lie about. There are three ruined tombs and some smaller ones of mud bricks, and they make mud bricks there still. The villages of the Abyan are most poverty-stricken places.

The first day we had our camels loaded with joware, and at Bir Mighar we took up fuel. From Hagheri Ask to Khanfar is about 6 miles, and we spent two hours over it. Trees became more numerous, and good large ones, chiefly arrack and acacia, and a few small fan palms. There were quantities of birds' nests, in every way a contrast to ours, for, instead of warm woolly ones, safe from wind and rain in the innermost recesses of our soft-leaved, easily climbed trees, these were loose open-work airy little baskets dancing on the outer tips of the thorny branches. When we reached the Wadi Banna, or Benna, the boundary between the Beled Fadhli and Beled Yafei, winding indeed was our way, for we were in thick wood; swords and daggers had to be used to cut a path, and we were brought to a standstill more than once, with our heads bent under trees, not daring to lift them. It would be easy for the inhabitants to stop an enemy's attack here. The smell of the arrack is not at all pleasant. Two Fadhlis were once directed into the Banna bed by the Yafei of Al Husn, and when in the wood they set fire to it and burnt them. The inhabitants do not venture off the path.

FROM YEHÀZAHAZ, LOOKING OVER THE PASS TOWARD ADAHAN, SOKOTRA.

We encamped not far from the town, amongst some large arrack bushes on the sand, and surrounded by mounds scattered over with bits of glass. There has been a succession of towns here, and the present town is situated on large mounds near some somewhat ruinous forts.

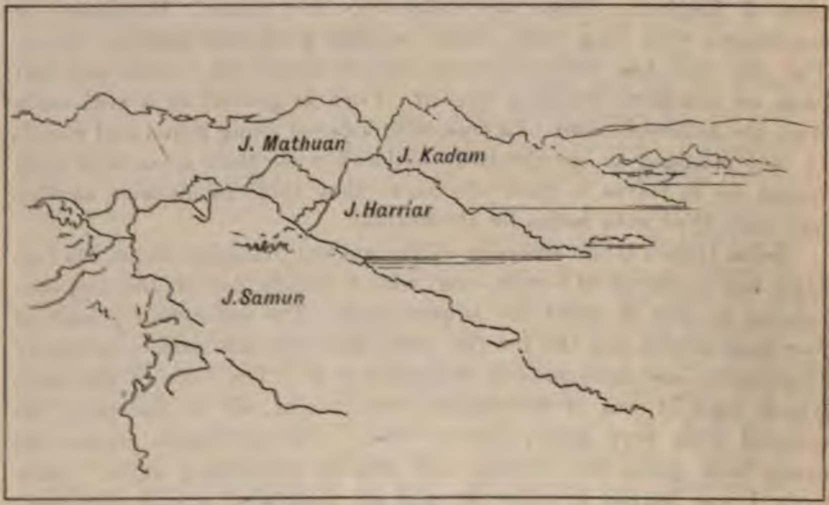
It would take an immense quantity of digging to come on Himyaritic remains. Many gold coins are found, and set on the jembias; our old Musaben had two on his dagger, about four hundred years old. Boubakr bin Saïd, Sultan of the Lower Yafei, was to come in two days to keep the feast of a saint buried here. In the mean time we surveyed our surroundings. The ground under the arrack bushes is perforated through and through by rats with bushy tips to their tails, as far as the utmost branch extends. Sometimes we felt our feet sinking, and discovered we were walking over the site of a vanished bush. There is an old ruined castle, with pretty herring-bone patterns and open-work windows. The principal well, a little distance from the town, is very close by the present fortress, where the sultan lives. There is a gunpowder factory of a primitive kind, for there is plenty of saltpetre to be found close by. We went all about the village quite comfortably with a couple of Yafei guards, and the people were civil. We saw curious ovens, like pots with lids, and oxen returning with the dustpans they use for scraping the sand off the cultivable soil, and many preparations for the feast in the way of food and very smart new indigo-dyed clothes. Photography, sketching, and unpacking the gifts for the sultan occupied our time. The mosquitos were awful. The sultan came to visit us very suddenly in the afternoon—a rather handsome, sly-looking man. He brought some honey, and made himself most agreeable till we spoke of going to Al Kara. He immediately began to speak of danger. He read the letter of introduction with more discretion than I have observed in any of the Arab sultans I have seen. Instead of reading to a crowd of slaves, he banished all but one very confidential, though dirty man, and read this letter and one previously sent. When he left, my husband told him the sooner he sent a message as to the possibilities of going to Al Kara the better it would be for him; and we also told Musaben to tell the Bedous there would be money for them.

It appeared, after much fruitless negotiation, that the sultan was determined to do the Bedous. He arrived very soon after breakfast, *i.e.* before seven, and demanded 500 Rs. for himself, which he immediately lowered of his own accord to 400 Rs., and gave us to understand danger would be averted if we paid this sum. He carried off 100 Rs. for coffee and a bundle of turbans and other garments. No one but Musaben was to know of the money, and the fat parcel he himself stuffed into the clothes of his dirty confidant, explaining to us and them that he should only show an aluminium box as his sole gift, and walked off holding it ostentatiously between his finger and thumb. Later we walked round the castle, and were let into the courtyard. The sultan saw us from a window in his tower, and beckoned us up. We had to go through gateways on all sides of the tower, so that they can quite command the entrance. We went up a high winding stair to a room about 10 feet square, where we sat on the floor and had coffee with cloves and no sugar, and a coarse kind of sweetmeat. His first question was, "Where is the gun?" I said, "Where is Al Kara?" So he laughed merrily, and said, "You shall not go to Al Kara till I have the gun." So I told him he should not have the gun till we had been. He then told my husband he must pay 1000 Rs. and the gun first, and he would manage the Bedous; but my husband said he would pay afterwards, and not more than 400 Rs. So this conversation went on, and we left. Musaben was surprised that we had been admitted.

We spent our days taking long walks in the cultivated fields, stepping on banks between the canals, or abrs. There were many trees, and acres of dukha grown for making oil, gilgil, and other crops; and the shade, the birds, the greenery, and water made it a pleasant relief from the sandy mounds. The workpeople are slaves of the subordinate race of Hagheri. There are really very few Arabs. Watchmen or scarecrows, with long canes, stand on high platforms scattered about. The old well has very-much-worn stones round its mouth, and had once an extensive building over it. Corn is ground in a mill made from the hollowed trunk of a tree, with a camel going round and round. It was amusing to see the little children with their arms held aloft bound up in leaves to their elbows, to keep their hands nice, as they had been dyed with henna for the festival.

Jebel Gabeil is the acropolis of the ancient Khanfar, about 200 feet high and a quarter of a mile long, with a double fort on the top, containing an area of about 100 square yards. The outer wall is built of fine large stones, and the interior has a beautiful foundation, evidently Himyaritic, and commands an extensive view. The tomb of the saint whose feast it was is surrounded with tombs, all in disrepair, but covered with very pretty carved wood. The procession passed our camp both going and coming, and was an interesting sight. Quite early I was begged to come out and see crowds of women and girls, who had come to visit me with their new clothes, some indigo and some of red ingrain. They wear the same shape as in the Hadramut, but do not cover their faces. They wear a good deal of jewellery, and paint their faces yellow. I did not see any of the fantastic patterns I saw in the Hadramut on the faces. First came four men with lances, dancing to and fro, then the sultan on a camel, dressed in red and purple and gold, and after him about thirty soldiers. A large white and red flag followed. On his return the sultan stopped and delivered a short address; the bystanders assenting by shouting "Nahm! Nahm!"

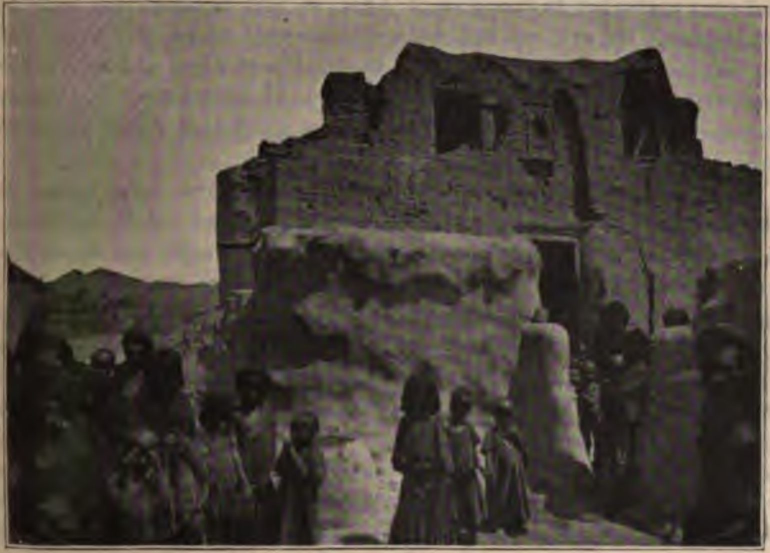
The Sultan came constantly, always raising his demands. Finally, when he could not get what he wanted, and we saw it was not safe to trust ourselves in the hands of so shifty a man, he became so insistent that my husband told him "he had seen enough of him; he might leave our camp; we would not travel with him." Off went the sultan in such a hurry that he left his stick behind, and sent us a message that we were not to pass another night in his country. We sent back a message that we would not stir till morning. He came early himself to say we were to go back over the Wadi Banna, and not the shortest way to the Fadhli country, unless we gave him more money. We would not speak to him ourselves, and let him see the greatest amusement on our part. When we did go, we only went a very little way in the prescribed direction, then turned round, our army being a rearguard rushing up hillocks to watch for pursuers. We reached Al Khaur, a village with many ruined castles, and camped in frightful dust. The Wazier Abdullah bin Abdurrahman had been sent by the Fadhli Sultan to welcome us. He proved a very agreeable travelling companion. He is young and refined looking.



FROM JEBEL SARRAR, LOOKING NORTH-EAST.

We saw a great deal of cattle about. There is a sheer rock overhanging the village 1000 feet above the plain. Theodore ascended Jebel Sarrar to see the ruins. A fine paved road, protected by forts, climbs up past a curious square stone said to be full of money, and goes zigzag through a narrow gulley like the walls at Zimbabwe. At the top there is a very strong fortress with many walls, and three cisterns just like the smaller of the tanks at Aden, with steps down into them, all covered with cement. This has been a very strong fortification, protecting and overlooking the whole of the Abyan from Jebel Goddam beyond Shukra to Jebel Shemshan at Aden. The following day we started for Dirgheg. The country is all irrigated by water brought from Masana by a channel called Nazai. At the corner of the Wadi Hassan the abrs branch off in every direction. The sources belong to the Yafei, and the Fadhli pay them annually 25 Maria Theresa dollars, a basket of dates, and a turban for the sultan, but the management is in the hands of seyids in *inam* for ever, they being supposed to be neutral, for fear a war might produce a drought. Still, in time of war the water often is cut off. The banks of the abyrs were full of castor-oil bushes, cotton myrtle, tamarisk, all smothered with a pretty creeper with yellow flowers and little scarlet gourds.

Dirgheg lies just on the left bank of the Wadi Hassan in an almost desert place. There are many dars, or towers, where the wealthy Arabs, of whom there is a considerable population, live. The servile tribe of Hagheri live in reed huts; we saw them thrashing gilgil and vetch. There are a market and a few shops. I had no trouble about taking photographs. Once, however, one of our attendants asked a man to move out of my way, and gave him a little push. Out he pulled his ghembia, and there was a scrimmage very dangerous to my camera and its appurtenances, as they were going to be used as weapons of defence. I rushed into the midst, and they stopped fighting to tell me not to be afraid, and peace was restored. I think it requires some courage to plunge out of the tent into the burning sand with the camera, but it never seems so hot once one is out. We were given over by our soldiers to the charge of two inhabitants of Dirgheg, and were quite elated at hearing on other authority than our own, "They can speak Arabic."



HOUSE AND OVEN, DIRGHEG, BEHD FADHLI.

We had on our return the delightful pleasure of a letter from Sultan

Boubakr, making another try for the gun, and saying he would come and take us to Al Husn. The messenger was fetched, and scornfully told by my husband that it was too late; we would not think of travelling with so bad a man. I said, "You have a great thief for your sultan, and a great liar," and told him all about the money and clothes he had secretly taken; so, no doubt, he had to disgorge some, after all. Musaben laughed very much, and said my imitation of the sultan's manner was so good he must get two sheikhs to hear the Bibi mimic the Yafei Sultan. The Yafei messenger was much interested. I told the whole story, and how we had gone round three trees and departed our own way, adding, "The sultan could see us from his own castle;" and he said, "Yes, he did." We told him all his conduct was written down and sent yesterday to the Wali of Aden, so now he might be sorry and frightened. We said we had been treated well by all the other Yafei we had met, but the sultan wanted to cheat both them and us. Indeed, it grieves us to hear the kind Yafei spoken of with horror and detestation by the Fadhli, but no doubt they have a different point of view to ours.

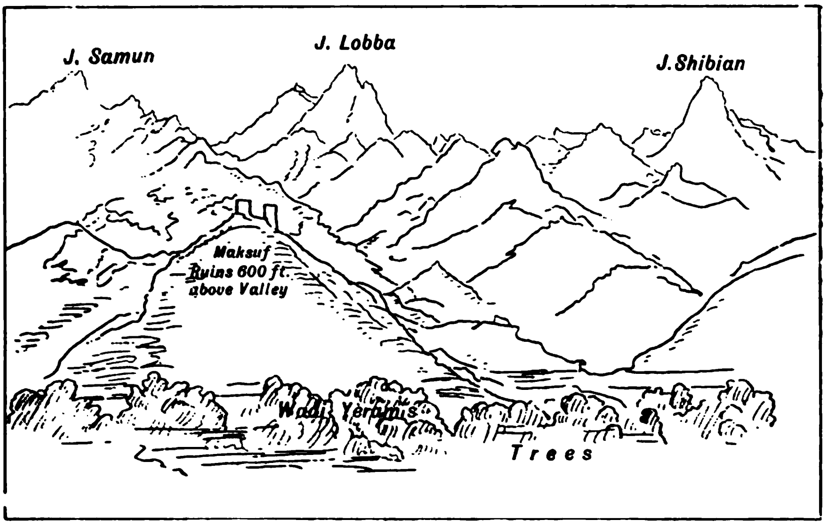
We went to another village called Abr Shebba, more under the mountains. We were shown about very civilly, and taken to the door of a large dar, and asked if we wished to go in. We did not know if we were wanted, so made an indefinite answer. There was a difference of opinion, and at last they said the Bibi should go in; so I crossed the court and entered the house, and had hardly done so when my hand was seized, and I was dragged by a man through black darkness round and round. I stepped high, and as quickly as I could rushed after him. At the third round I saw a little light shining on the roughest possible earthen steps, and was pulled into a little room, where I was greeted with cries of amazement by some women, and then continued my way unaided to the top of the tower. The parapets were ornamented with gazelle horns. After some time I wanted to go down, but I was on my way taken to a large room where manners demanded I should settle down for coffee. Every one was very kind, and for greater friendliness a naked baby four months old was placed in my hands. When I wished to return it it was made to sit on my knee. It soon kindly cried, and was, to my joy, removed. It had never in its life been completely washed, though several large spots and trimmings had been painted on its head. Theodore joined me at last, and had coffee too.

The first thing next morning, before our departure to Al Ma'a, another letter came from the Yafei Sultan about Al Husn; but the messenger was told that once was enough to see that great thief (Harami), and he could take the letter back. It was 14 miles to Al Ma'a, and took us six hours. We passed up the Wadi Hassan, and saw Al Husn in the distance. We did not go quite to the corner where the Wadi Hassan turns east. It is considered too near the Yafei frontier to be safe, and the Fadhli always use a narrow pass called Tarik al Kaha, going round Mount Gherash. It gets narrower and steeper as it goes on zigzagging up slabs of shale, with only room for one camel at a time. There are any amount of ambush places, especially on the north. The pass goes uphill, west to east, and the steepest end is at the east. A spur runs out west on the north side about 50 feet high, convenient to shoot over. The approaches are quite open. It leads through Wadi Goddam to Wadi Hassan, and at the entrance to Wadi Hassan, Fadhli Bedous are for ever stationed to watch for Yafei attacks on a tiny jutting hill. Three men of ours, sheikhs who had come to meet us, galloped forward to explain to them who we were, and ascertain that all was safe. They fired a gun over our heads. We saw several baboons. We saw several little heaps of stones, and were told they marked spots where Fadhli had been shot by Yafei. A very large heap is formed by those who pass the valley safely for good luck. We also passed the tomb of a seyid with four large smooth stones at the top anointed with oil for the Ed. Before we reached Al Ma'a the river-bed narrowed in from the other side, and along the raised bank at short intervals were watch-towers of the Yafei. At Al Ma'a they are quite close, about half a mile off at most. The country still very arid and barren, but the mountains very fine.

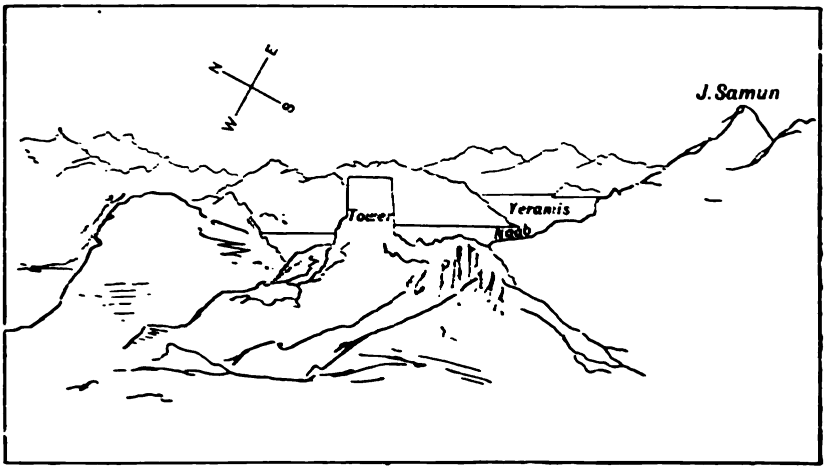
Al Ma'a is a wretched hamlet, which has seen very much better days. There are high ruined castles, destroyed by the present sultan, as Al Ma'a and its headman were in revolt. Now there are only three or four Arab houses and a hamlet of reed huts. The valley is about 2 miles wide, and there are four or five Yafei towers near. Our escort were very much afraid. They said that the Yafei might shoot us, though a cannon would be necessary, and lay the blame on the Fadhli, that they would by no means let us camp anywhere but in a most disgustingly dusty place next the village; and they kept sharp watch all night, talking much. The towers protect the approach to the Wadi Theba, which here goes up or comes down from Al Kara. The country round is in a perpetual state of ferment, like Germany in the Middle Ages, every one on the look-out for attacks from enemies.

We were up and off before the sun rose, our party being increased by Sultan Salem, brother to the Fadhli Sultan. He is twenty, and though not dark in colour, has woolly hair. He and the soldiers and the wazier, Abdullah bin Abdurrahman, rode at some distance to our left, between us and the dangerous Yafei towers. The Goddam, or Kadam range, which separates the Wadi Yeramis from the Abyan, is a mass of arid peaks, none reaching to more than 2000 feet. A road leads from Al Ma'a across the mountains to the sea at Asala.

We reached Karyatel Maksuf about ten, the valleys getting narrower and more woody and grassy as we approached. There is an ancient fort on a hill 650 feet above the valley, and about 1300 above the sea, with a glorious view over the Goddam range to the sea. There is another ruin of a round fort on the left of the valley. We went on a mile to a delightful place, where there were trees, water, and reeds, and beautiful views through shady glades to the mountain peaks, and many cattle.

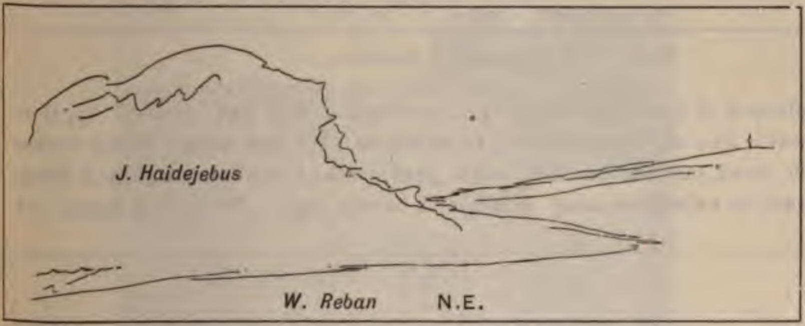


VIEW FROM ABOVE WADI YERAMIS, LOOKING SOUTH-EAST FROM MAKSUF.



FROM ABOVE THE SOUTH-WEST SIDE OF WADI YERAMIS AT MAKSUF.

We wished to remain there, but were told it was better to get on to Naab, as there was a little danger. We quite understood that danger was a bogy to prevent us keeping them from a town, and so we pointed out that the Yafei were not likely to come down a light-coloured mountain-side with only a few tamarisks into a valley half a mile wide; so my husband firmly said we would stay on the clean sand. We saw many baboons. The second ruin, which is a mile further up the Wadi Yeramis than the first, is evidently Himyaritic, and protected the first town after Banna on the way to the Hadramut. It is a circular, crowning a hill 300 feet high, and enclosing a space of 50 yards in diameter. On the north-east side it is protected by five square towers, and has one gate to the south. It was the acropolis of a large town, lying in all directions, but chiefly to the north-east. It has evidently been a place of considerable strength, as the Wadi Yeramis is only half a mile wide here. There is a regular stream of water in a narrow channel, and the whole valley is green and fertile.

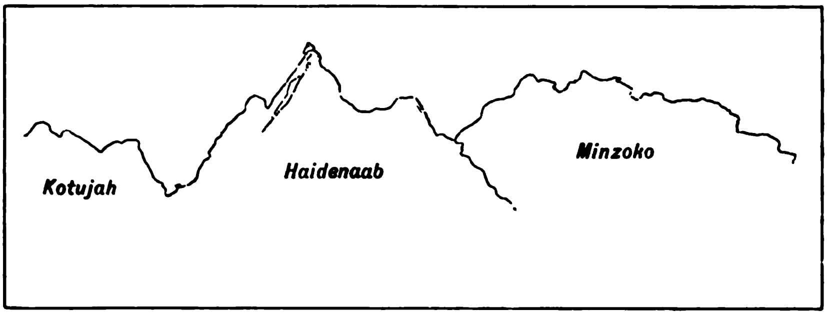


FROM YERAD NEAR NAAB, LOOKING NORTH-EAST.

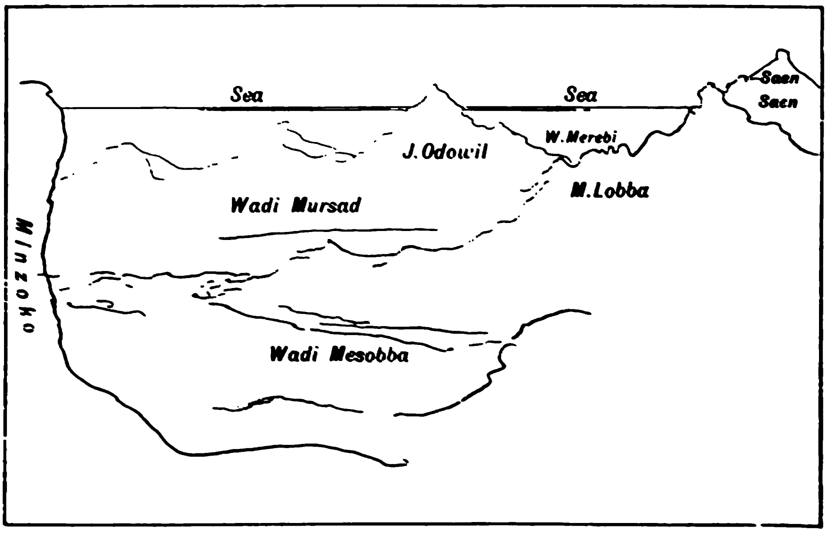
The first ruin is probably Persian or later Arabian. Before we entered this narrow part of the valley, it was curious to see below the peaked mountains a flat-topped effusion of basalt, called borum, advanced forward. We made a very early start, and gradually got into a thick low wood, but as the Wadi Yeramis widened out there were only tamarisks. Our ascent was rapid, and after about an hour we turned due east, this part being very bare-looking, though there were a good many horrid acacias and also euphorbias with rounded trunks. We soon burst upon a lovely plain all mapped out in fields and abrs. It is 6 miles to Naab, and we took three hours. We passed through full 2 miles of this fertility, with three or four villages—Souat, Nogat, Arrawa, and Old Naab, with mosque, minar, and a fine old house all tumbling into ruins. Wadi Yeramis is much opened out here, and the lower part is bounded by the basalt in walls about 200 feet high, sometimes with mounds within them again, and hillocks of the same formation as the high mountains. This cultivated paradise is the property of Sultan Ahmet bin Salem, brother of Sultan Saleh of the coast, and may be said to be the pick of his whole dominions.

Arrawa has twenty-four shops, and the sultan gets half a real (or

M.T. dollar) on all merchandise camels going up to the Beled Yafei. There were many bales of merchandise in a sort of custom-house when we arrived at this great centre of inland traffic. We encamped on the opposite side of the Wadi from the town, which is perched on a raised plateau of earth banks. When we halted, and had climbed up, there was a line of people waiting to salute us. We and Sultan Salem walked in front, our eleven men with guns walked behind, singing a Merghazi, or salutation song, of which I have a copy. We halted again, and they fired ten salutes; then we advanced again, Sultan Salem leading, when twenty of the local sultan's soldiers came forward and kissed his hand and shook ours. Then there was a refreshment of five or six cups of coffee and ginger, very weak, on the floor in a tower. There was



FROM HAIDEJEBUS.



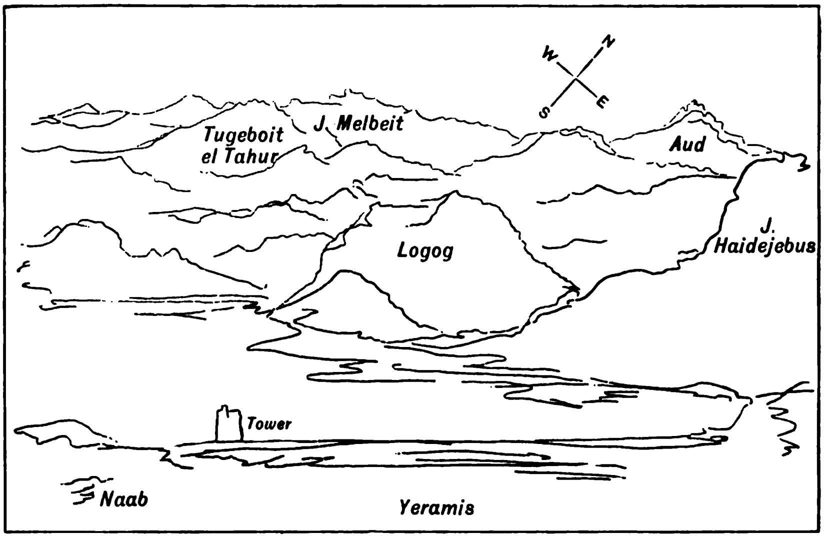
FROM HAIDENAAB, LOOKING SOUTH-WEST.

milk in the first cups, but it became exhausted. We never saw the sultan all the time we were there, for they said he had a wound in his leg.

The earthen cliffs are about 30 feet high, and we had to go a very roundabout way to get up by narrow gullies. My husband went up a hill, Yerad, just behind Naab, with an old Arab fort on it above the Yeramis, which ends here; then begins Wadi Reban, with a clear course north-east for 3 miles, then north, and then a long stretch east again.

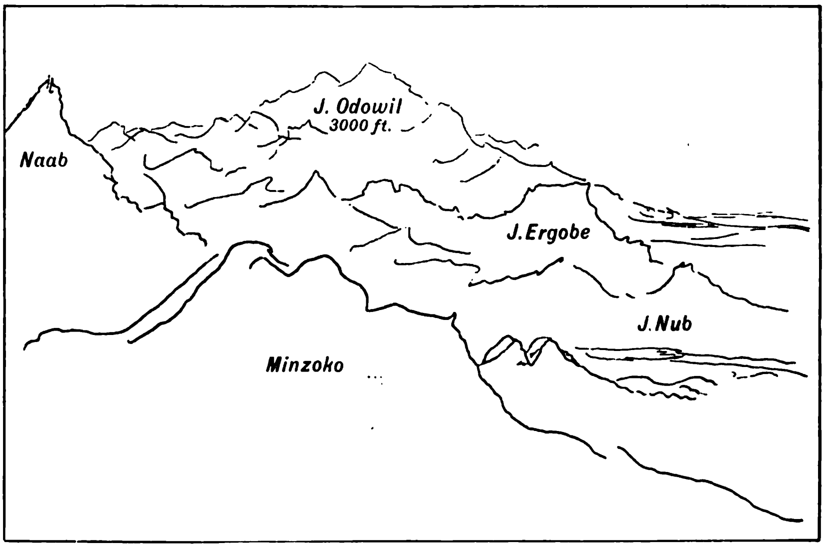
SHEIKH SEIL AND SULTAN HAIDAN, SON OF THE SULTAN OF NAAB, IN NAAB CASTLE.

There was a lovely view over the Yafei mountains on the north, and Goddam range on the south. A Bedou who went with him told him all the names. Though he could understand when they talked to him, he could not understand two talking together. The Sultan Salem bin Saleh's old abandoned castle has some nice decoration about it. They left it because there were so many jinni (*i.e.* ghosts) in it. Our informant had not seen them, but only heard of them. March 12, he went up what he thought was the highest mountain of the Goddam range, Minzoko, just behind Naab, and made it 2000 feet, but considered its



FROM HAIDENAAB, LOOKING NORTH-WEST.

neighbour Haidenaab 300 or 400 feet higher. The Tarik Minzoko goes between them.



FROM SHARIAH, LOOKING SOUTH-WEST.

Our party was now increased by another "prince," Sultan Haidar, son of the Sultan of Naab, a person delightful to contemplate. He was got up in Bedou style; his hair, fluffy and long, was tied back by a fillet, and stuck out in a bush behind. He has a curious countenance, and very weak eyes. He was wrapped in a couple of large blue cotton cloths with very long fringes, half a yard at least. The cotton is plastered with indigo, even beyond the dye, and when calendered, as they are when new, gleam purple and red. The richer you are the bluer you are, and Sultan Haidar was very blue indeed. The curious thing about these blue people is that, as the prominent parts of the face and body are the darkest, there is an odd inside-out effect.

When we left Naab we turned into the Wadi Reban to Shariah—three hours and ten minutes, 7 geographical miles, 4 north-east and 3 north—and ascended 350 feet. Wadi Reban is a quarter of a mile wide near Naab, but after 2 miles opens out; and there are gardens, and now and again running water appears, and plenty of trees. At the fourth mile, near a fort, we turned sharply to the north, past Jebel Riah, where Wadi Riah comes in, and then reached a wide open space, where Wadi Silib joins in and there are no less than four old villages, called Shariah. Jebel Shaas was beyond us, very high, and Wadi Ghiuda to the right. This large open space is girt with mountains 500 to 5000 feet high, and is a great junction for the waters from Wadis Reban, Silib, and Ghiuda. It was once exceedingly populous, and considerable towns were perched on the rocks, forming gates to the Wadi Silib, and two others at a great elevation on the opposite side. The cause of the decrease in population

OLD NAAB, SHOWING WHERE WADI REBAN GOES ON FROM WADI YERANUS.

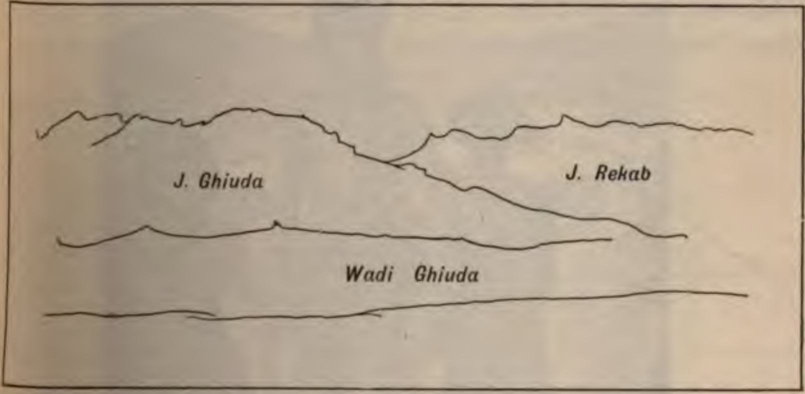
in Arabia must be the constant intertribal warfare and the gradual filling up of the valleys with sand. Great banks of sand 20 feet high line the river-beds, and wash away with the heavy rains, which contribute to the silting up. This country must have been very fertile to have supported the population, for the four towns must have been large. The stone buildings alone would make any one of the four larger than most towns in Arabia to-day, and there must have been the usual hut population. We had a very pleasant camp among trees, and had a steep scramble to the ruins.

An enthusiastic geologist would have enjoyed our next day's journey immensely; we went through such a strange weird volcanic valley—not a wadi, but a sheb, narrower and shallower. The road is Tarik Sauda. The strata of the rocks are heaved up at a very steep angle, and we had to ride along smooth rocks, sometimes without any trace of a road at all among the stones; sometimes we had to make very great windings among heaps and hillocks of all sorts of different-coloured earths. Hardly a green thing was to be seen, and altogether the whole place looked dreary and desolate; but we were much interested in this day's journey among the great scarred and seamed volcanic mountains. We ascended 650 feet—very difficult indeed; the steepest part is called Akaba Sauda. We reached the headwater of the Wadi Ghiuda at the top of the Akaba, about 7 miles, in four hours, 2000 feet up, Naab, 1000 feet; to Shariah, 350; to Ghiuda, 650. We

WADI GHINDA, LOOKING EAST.

passed Dogoter and M'Haider, mere names. We encamped on a waste of stones; no tent-pegs could be used, and it was windy and cold.

Now was our time to send by Musaben to the camp of the sultans three very gay blankets for them and Abdullah bin Abdurrahman. The long name of the wazir's father had constantly to be on our lips on account of his dignity, for they are like the Russians in that respect—common people's fathers are not mentioned. The name was marvellously shortened to 'B'd'rahman. We were thought to be in danger that night, and did not make a very early start, as we had to load up water; and we two climbed down 350 feet into the Wadi Ghiuda, that I might take photographs. It was so pretty, with pools of water and creepers hanging on the trees.

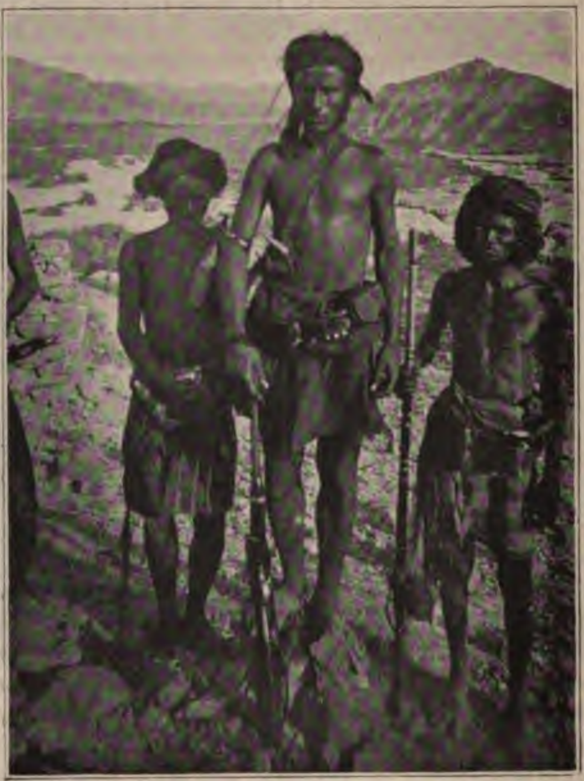


FROM CAMP BETWEEN AKABA BEVA AND AKABA SAUDA, LOOKING SOUTH-WEST.

The sultans meanwhile sat up in their beds of leaves wrapped in their blankets. How absurd it seems that two princes and a prime minister should have to sleep out because two English choose to travel in their country! Not a word of thanks did we ever get for those blankets, but they were evidently much appreciated, for their recipients sat on their camels wrapped over head and ears in them.

We joined the camels on the way, and after two hours of stones ascended the very steep Akaba Beva. The view from the hills above—about 2500 feet—is splendid, all the Yafei mountains and the Goddam range ending at Haide Naab, and giving place to the higher mountains of Rekab and Ghiuda. We descended, not much, into the lovely Wadi Hadda, full of trees smothered with a kind of vine, with thick glossy india-rubber-like leaves; then up Akaba Hadda to the huge plain of Mis'hal, full of villages, but ill-supplied with water. There are only some very bad wells for the cattle, and they have to fetch drinking-water from afar, from Ghenab and Lammas. We engaged a Bedou's camel to keep us supplied. The plain is 2700 feet above the sea. The sheikh's name is

Mohommod bin Nasr, Nakai; this is the first time we heard this pro
nunciation of the prophet's name. He was determined to give us
grand reception. Sheikh Seil had gone forward to announce us fro
Ghinda, and he came to meet us on his pony down both akabas—a fearfu
journey. From a distance we could see the preparations. There was
long line on the sandy plain of between two and three hundred Bedou
naked save for a blue scarf round their waists, with dagger, powde
horn, etc., stuck in. Some had guns, matchlocks, and some had spear

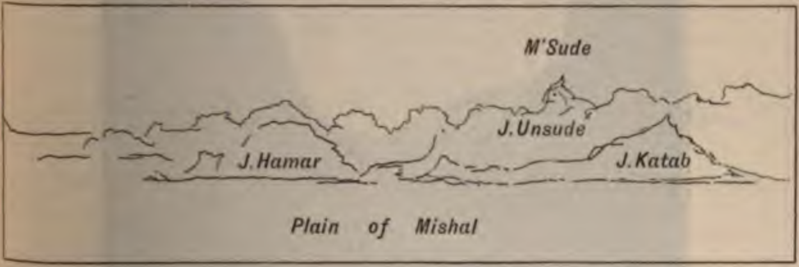


WADI GHINDA, LOOKING EAST.

They mostly had their long hair tied up and sticking out in a f
behind, as funny a long line of men as ever one saw.

We dismounted, and all our party advanced hand-in-hand, fourtee
besides ourselves and Manthaios, we being the only ones who did n
know the words in which to chant our response to the welcomi
shout. This they interrupted occasionally by the high gurgling sou
they are so fond of, constantly coming out of the rank, one or other, a
firing a gun and retiring. The blue-bearded Sheikh Seil galloped

and down in front of us, twirling his spear. We stopped 150 yards from them, and after much more firing the spearmen began to parade before us in a serpentine way, two and two, backwards and forwards, zigzag, and round and round the gunners, gradually getting nearer and nearer to us, and dragging the gunners after them, with a red flag, a seyid, and their shiekh, Mohommod bin Nasr, between them. When they got quite close they welcomed us, and we said "Peace" to them. They passed us so many times that we could see and notice them well. Some were very tall; one led his tiny little boy, and he was very lame. The lancers danced very prettily, having a man a little way in front of them executing wild capers and throwing up his spear and catching it, singing all the while songs of welcome. We could not understand more than some allusions, which assured us they were composed for the occasion. After many gyrations they retired to their former place, and then a herald came forward and made a solemn address of welcome.



FROM MISHAL, LOOKING SOUTH.

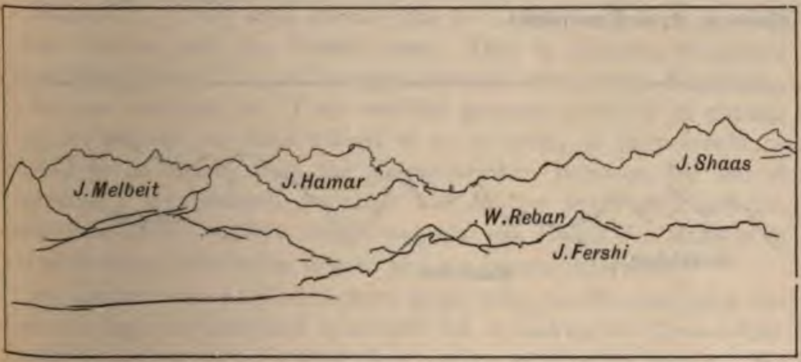
Then our turn came, and we sent forth a line with Sultan Haidar in it to sing and let off guns. When the two lines met they shook hands and kissed, the sultans and seyids being kissed on the forehead and the upper part of the leg. When they returned to us all our party joined hands to go to our camp, now ready, a good distance, all keeping step in a kind of stilted, prancing way, singing. The spearmen in front danced with all manner of light and graceful antics, and we were nearly stifled with the dust; and the din was so appalling that we arrived quite dazed at our tents after this welcome, which had lasted fully an hour. We were the first white people who had been at Mis'hal. I tore my camera from its case to take a photograph before the people left us, and it did better than I could have expected in such a crowd, with no sun and so much whirling dust. The town consists of a low square dar and a collection of brushwood arbours, so slight that there is no pretension of concealing anything that goes on inside. We were very thankful for a large pot of coffee and ginger, sent by a sultan, and a fat lamb. The princes ventured to leave us in charge of Abdullah bin Abdurrahman, and abode in the tower. Sultan Haidar went home from here.

The tableland of Mis'hal is approached by three akabas : (1) Sauda to 2000 feet; (2) Beva, to 2500 feet; (3) Hadda, to 2750 feet. Th Nakai tribe live here, and are on friendly terms with the Fadhli— sufficiently rare circumstance in this country. The Nakai chief can pu four hundred men in the field to help the Fadhli. The Markashi are a war; they live in the Goddam range, and have been giving the sulta trouble lately.

FADHLI AT SHAREAH, WADI REBAN.

The road to Shukra most frequented is the Tarik el Arkob; east ward goes the road to the Hadramut, over the plain. Northward i the mountainous country of the Aodeli tribe, where the rain is some times so cold that it is hard and quite white, and the water like ston The plain is 10 or 15 miles long, by about 4 or 5 miles at its broades If irrigated it would yield enormously. The well is of great depth, bu the water very bad. My husband ascended a mountain about 3000 fee high, but only 400 feet above the plain, with a most remarkable vie over the Aodeli mountains, about 20 miles away, towering up to a grea height—far higher than the Yafei range, which Mr. Tate gives as 7000 feet: these are probably 10,000 feet. We were not well the last day at Mis'hal.

We took advantage of the curiosity of the Aodeli, who had just arrived with a Kafila, to make them stay in our camp and question them. The El Khaur mountains look most fascinating to see only from a distance, and are inhabited by lawless tribes, who would murder any traveller who ventured among them, owing allegiance to no man, and having no wholesome fear of the Wali of Aden before their eyes; they are all Beduin. The Aodeli are a very large tribe, and say they have 4000 men for war; the Markashi can put 500 or 600 in the field; the Nakai 500; and the Fadhli 2000. Lauda, the chief town of the Aodeli, is much bigger than Shibam; there are many Arabs. The sultan is Mohamed bin Saleh. It is six hours from Mis'hal—34 miles—and is situated below the mountains. Above it is El Betha—Sultan Saleh. Belad el Megheba, in the upper Yafei country, is under Sultan Hakam Mohamed bin Ali. Sabad el Baida Resass (where there must be lead) is not under the Turks; El Aodeli live there. Neither is Sahib Louda under the Turks; the inhabitants are Augheri. This has a very soft gutteral—the Arabic *ghain*.

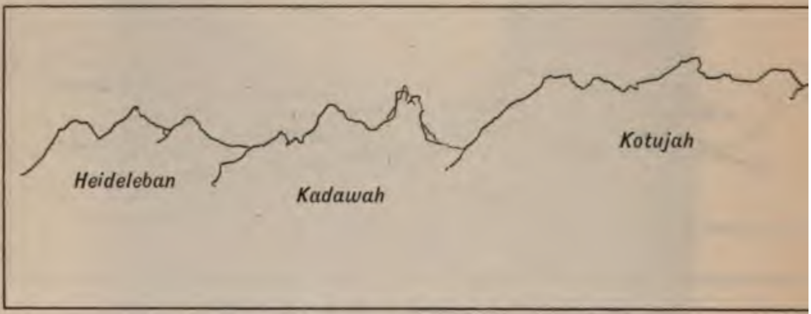


FROM ABOVE BIR LAMMAS, LOOKING NORTH-WEST.

Our next stage was Bir Lammas, about 4 miles off, mostly across the monotonous plain. We passed four dars and villages. In time of war Fadhli sultan comes and occupies one of these dars. We met sheikhs walking with little battle-axes on long poles—weapons in war, and in peace used for chopping wood, at all times emblems of their rank. The plain at length broke away, and we got into the narrow, and not very deep, wooded Wadi el Mimin. It has very precipitous sides of basalt, brown in colour, and making a very untidy attempt at being columnar. Bir Lammas is a great, and I must add, very dirty, halting-place for caravans going to Shukra, on the Tarik el Arkob, to El Kaur and the

Hadramut. We were encamped about 380 yards off, and thought it
very pretty place, with acacia trees and creepers making arbours of a
of them. The women do all the work here, having to fetch water fro
Bir Lammas and Ghenab for Mis'hal. The children, up to fourteen yea
of age, tend the flocks, and the men stroll about or sit in very warlike-look
ing conclaves, with guns and spears. Young children have wooden jembia
to accustom them to their use, and it is funny to see tiny urchins
three or four hurling reeds at each other in imitation of their elder
with more deadly weapons. The Beduins seem born in an element
war; one we heard of had lasted fifteen years, but was happily no
stopped for a little while.

The length of the Aodeli range is very striking, and must run fro
west to east for 30 or 40 miles, a massive even-topped range, with fe
breaks in it, and no peaks.



FROM WADI SAMLUF.

On a hill near the plain, about half a mile from Bir Lammas, ther
are ruins of goodish style, probably of the Ashabir period of Hamdan
We stayed at Bir Lammas two nights. We were to ride five hours fo
water. We were soon out of the wadi, and wandering over stony plain
scattered over with lumps of basalt. At last we came to the Wad
Samluf, and I begged that we might stop and have a camel fetched fo
water. I had to be dragged from my camel, and laid in the cinder-lik
sand till the tent was pitched, for, as my malarial fever was constant
and I had no tertian intervals, I lost my strength completely. We both
and several others, were very ill, and we were not strong enough t
get at our medicine-chest. The water was very bad. The Sulta
Salem and other grandees camped at the more dangerous open mout
of the valley. I had to be carried to the sea, 17 miles, on my bed
which was strengthened with tent-pegs and slung on tent-poles. Fro
the little sultan downwards there was not one who did not help mos
kindly. We went down gently 3000 feet. I cannot describe thi
journey, except that it was so very winding that I seemed to see th

camels meeting and passing me often. Fortunately the crossing of the low hot Abyan was short.

How glad I was to find myself in a rushing, roaring, rabble rout of men, women, and children tearing along beside me!—not a thing I generally like, but now it told me of the end of my weary journey. I was deposited on my bed in a tower, tent-pegs and poles removed, and left with a spearman on the doorstep to keep off intruders. The rest of our miserable fever-stricken party came in half an hour later. The Sultan of the Fadhli came to our tent to see us—a pleasant-faced, mustard-coloured man; his wife, too, the daughter of an Aden Sheikh, very handsome. They were very kind in sending milk, water-melons, and any little luxury they could. The sultan lives in a fine brown building with a stunted tower, a glorified Arab house, but nothing like those in the Hadramut. They send sharks' fins to China from here, as well as from Sokotra and the Somali coast. This is probably Ptolemy's Agmanisphe Kome. It is just the right distance from Arabia-Emporium, one day; so we found it. There was the greatest difficulty in getting a boat, for none of the ships wished to go to Aden, as they would be supposed to be coming from the plague-stricken Bombay, for fear of quarantine. My husband promised 100 Rs. for every day, and the sultan compelled a captain whose baggela was loaded for Mokalla to take us to Aden by refusing to give him his papers otherwise.

Our last moments at Shukra were spent lying on the sand with our heads on a bag, and sheltered by a little bit of sacking on three sticks. The sultan sat over us on a high chair, saying very polite things. We got on board our ship, at 3 o'clock, and from the ship admired Shugra, which looked very picturesque in the evening haze, with its towers, its few trees, and its many-peaked Goddam mountains behind. This is all I can write about this journey. It would have been better told, but that I only am left to tell it.

NOTES ON THE VISIT OF DR. BACH TO THE CATUQUINARÚ INDIANS OF AMAZONAS.

By Colonel GEORGE EARL CHURCH.

Dr. José Bach, of La Plata, Argentine Republic, who has made extensive explorations in the most dangerous and remote parts of the valley of the Amazon, visiting and studying the habits and customs of its savage tribes, has kindly given me some data of interest regarding a tribe known as the Catuquinarús, whom he visited during his voyage of 1896–1897. Among them, he found in use a peculiar telegraphic instrument, herein described, and which they call a "cambarysú," a sketch of which accompanies this paper.

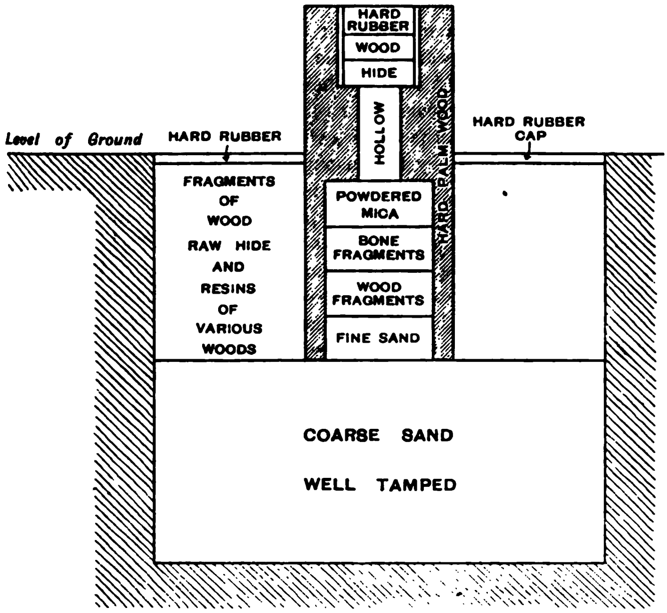
Dr. Bach says, "These Indians come from the frontiers of Bolivia and Perú, and occupy the lands between the rivers Embyrá and Embyrasú, which empty into the river Tarauacá near the river Jatuarana-Paraná. The Tarauacá flows into the river Juruá. The lands are hilly, very fertile, with an exuberant vegetation.

"I remained five days among these Indians. Their language is very similar to that of the Miranhas of Amazonas, and has a few words of the Therena of Western Matto Grosso. The following vocabulary will give an idea of it:—

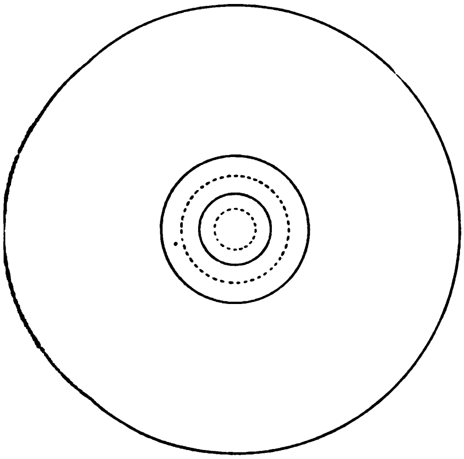
Vocabulary.

What tribe do you belong to?	Guabila-guateli-téna?
We belong to this	Amago-hé-pÿ.
No; I don't want it; I am not agreed	Acó.
I want it; I accept	Honaytÿ.
The head	Tacasú.
The hair	Anahé.
The eyes	Cesá.
The nose	Tinoâ.
The mouth	Agahó.
The teeth	Canha.
The neck	Yayoruá.
The breast	Putia.
The shoulders	Copey.
The arm	Yanó.
The stomach	Maricau.
The eyebrows	Namÿ.
The legs	Getemaupú.
The feet	Pihú.
The hands	Punÿ.
The house, or *malocca*	Ocausú.
The white man, or Christian	Carynosú.
A large boat	Moracatÿ.
A net or hammock	Ouÿsauarusú.
Arrows	Uhÿnasú.
Bow	Uhÿnarasúcó.
Poison for arrows	Orarÿ (not corarÿ).
An earthen pot	Comatÿnú.
Copal gum	Ananÿ.
Water	Uhehÿ.

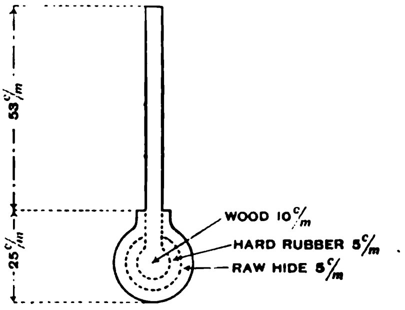
"It appears that these Indians, many years ago, were heard of elsewhere under the name of Catuquina, but their true name is Catuquinarú. They resemble the Miranhas in many respects—in types, customs, and use of arms. The group which I found numbered 196, the greater part being women. They were divided into four sections, about a mile distant one from the other. I noted that their *maloccas* (habitations) were of recent construction, dating, perhaps, a few months back, which indicated that they led either a nomadic life or had been expelled from their previous home by other Indians or by white men. The *maloccas* were all located on the same straight line, north and south. The chief of the Catuquinarú is called the Tuchau; his name is Cumaytaté. He always treated me with a certain disconfidence, as is customary among the Indians, even in contact with their friends. I had to be very persistent to acquire a slight friendship with him, as a guarantee against the other members of the tribe, offering him strong drinks and presenting him with objects of different colours, especially red and blue, which pleased him best. All this I did with a view to learn something of the extraordinary telegraphic apparatus, called the cambarysú, which these Indians use, and one of which they have hidden in each *malocca* occupied by the tribe. I made every effort to procure and take with me at least one of these wonderful instruments, but could only get the promise of one if, on my return, I would give arms and ammunition in exchange.



CAMBARYSÚ OR TELEGRAPH OF THE CATUQUINARÚ INDIANS. CROSS-SECTION. SCALE $\frac{1}{20}$.



PLAN.



CLUB.

" With much difficulty, I persuaded the Tuchau to let me see one of them. He dismounted the whole mysterious machine with great care. I examined it very minutely, taking measurements of all its parts, and noting the materials of whic it is composed.

"As previously stated, there is one of these instruments hidden in each *malocc* and the *maloccas* are about a mile distant one from the other, and all on a direc line north and south. It appears that the instruments are *en rapport* with eac other; and, when struck with a club, the neighbouring ones to the north and south if not above a mile distant, respond to or echo the blow. To this an Indian answer by striking the instrument in the *malocca* with which it is desired to communicat which blow in turn is echoed by the instrument originally struck. Each *malocc* has its own series of signals. So enclosed is each instrument in the *malocca* tha when standing outside and near the building, it is difficult to hear a blow, bu nevertheless, is heard distinctly in the next *malocca*, a mile distant, in the manne indicated. The Tuchau gave me an example of signalling. With a prolonge interval, he struck the instrument twice with the club, which, as I understoo was to indicate attention, or that a conference was desired. This was responded t by the same instrument, as a result of a single blow given by some one on the nex apparatus, nearly a mile distant. Then commenced a long conversation, which could not comprehend. The only thing I gathered was from the mimicry of th Indians, indicating that there were no sinister intentions.

"Before the Tuchau, Cumaytaté, left his own *malocca* to accompany me, h turned over the command to his eldest son, named Cumaytaté-hy. On arriving a the next *malocca*, we met the Tuchau-hy, Bacarutú by name, who gave me pleasant reception. At the following *malocca*, we found the Tuchau, Lehyotú, wh received us very coldly, which caused me to note that he was much disgusted After looking at the telegraphic instrument, I commenced a conversation with th Indians, who answered that 'they belonged to Lehyotú,' and said, after a lon conversation between the chiefs, that they 'were *formerly* Catuquinarús.' Thi phenomenon of the segmentation of tribes in this manner, I have also observe among the Botacudos and the Chamacocos.

"We then went on to the last *malocca*, where we were kindly received by th Tuchau-hy (Mahahyotú by name), and where we also found a telegraphic apparatus the same as in the other *maloccas*."

I have had several conversations with Dr. Bach regarding thi wonderful telegraphic system of a barbaric tribe. I can only accoun for its clear and distinct transmission of sound by supposing that ther is in the locality some stratum of earth or rock of such composition tha it easily transmits the vibrations of the blow given upon one of th instruments, which, being enclosed and nearly buried in the earth certainly does not transmit the sound through the air. I have for year thought that the telephone of the future must be two unconnecte instruments, so thoroughly *en rapport* with each other that, even i separated by the Atlantic ocean, a word spoken into one would b echoed by the other; but here, in the invention described, we have som semi-savage treading close upon the heels of the highest civilization.

Owing to the newness of their habitations, Dr. Bach appears t believe that these Indians are nomads. This may be true, but withi a certain limited area. The Amazon tribes, in general, remain in, an try to control for themselves and their descendants, a river valley or section of a valley of considerable length, and, when they have nearl exhausted the game and fish of a certain locality, move to another, which for a time has been at rest. This is probably true of the Catuquinarús, who were formerly, as Dr. Bach says, known as the Cataquinas.

Castelnau, however, in 1855, fixed the habitat of one part of this tribe where Dr. Bach found it—lat. 10° 20′ S., and long. 72° W. from Paris; but another part of it in lat. 5° S., and long. 69° 30′ W.—the former fraction at the headwaters of the Juruá, and the latter about 350 miles north-east, not far above the mouth of the Juruá.

It is notable that some tribes in South America are found in fragments widely separated from each other; and, at times, an entire tribe has moved its habitat from 500 to 1000 miles from its original home, more especially since the time of the Spanish and Portuguese conquest. Such changes during the last four centuries may have been largely due to the pressure put upon the several tribes as their conquerors penetrated inland, the Indians seeking to escape from the exactions and cruelty of merciless task-masters.

Dr. Bach gives us a notable example of the way the segmentation of a tribe sometimes takes place, and how the part which splits off assumes a new name, although claiming parentage with the original family. In the case mentioned, he says that the fragment held that they "were *formerly* Catuquinarús," but that they "now belonged to Lehyotú." It is important also to note that when the chief, Cumaytate, left his *malocca* to accompany Dr. Bach, only 3 or 4 miles, he turned over his command to his eldest son, Cumaytate-hy, *hy* being a kind of diminutive, indicating the next in rank or subordinate. This act shows how ceaselessly the Indian is on the alert, and Dr. Bach also noted that all their senses were keenly sharpened. But this I have found true of all the Indian tribes I have travelled among—their senses and instincts have been so developed by evolution that, in certain directions, they are superior to the most civilized white man, the latter having retrograded in many of the best qualities possessed by his savage ancestor.

I once met a horde of Yocaré savages among the falls of the Madeira branch of the Amazon river. The chief, a young fellow perhaps twenty-five years old, appeared to know everything that was going on around him. He seemed to have eyes in the back of his head, so acute were his senses. His hearing appeared to indicate, and his mind to define, the thousand things which were occurring in the tropical forest around us. Instinctively, he classified and estimated them at their true value as if they were under close and accurate analysis. As he sat dining with me at my camp table, in the simplicity of his nature and modesty of his nakedness, I could not help thinking that, in the evolution of man, many magnificent qualities have been sacrificed upon the altar of civilization.

SIR ARCHIBALD GEIKIE ON SCENERY AND LITERATURE.

The Romanes Lecture for 1898 was delivered at the Sheldonian Theatre, Oxford, by Sir Archibald Geikie, who selected as his subject "Types of Scenery and their Influence on Literature."* He limited the scope of his lecture strictly to the scenery of Great Britain, and almost entirely to British poets of past generations as affected by their familiar surroundings. He defined scenery as "those variations in the general aspect of the land that arise from the combined effects of three main geographical elements—topography, climate, and vegetation." With this definition in mind, the scenery of Great Britain is referable to the three great types of lowlands, uplands, and highlands, in each of which many individual varieties and shades of difference may be distinguished. Each type is considered with respect to the influence it has exercised on English literature in the past.

The lowlands of South-Eastern England are characterized by the gentle gradations of their surface forms, their generally favourable climate, fertile soil, and rich park-like vegetation. The streams flow softly along wide, flat valleys, and there is nothing bare or rugged to meet the eye. The placid peacefulness of these plains in their native alternation of woodland and meadow, or their more varied forms of cultivation, are reflected in verse as far back as Chaucer, Shakespeare, and Milton. To these great names Sir Archibald might, perhaps, have added Spenser, whose genius was so largely topographical. But in the multitude of illustrative examples of the influence of lowland scenery, he was constrained to limit himself to three—Cowper, Thomson, and Burns. Cowper was profoundly affected by the quiet, soothing beauty of the typically English valley of the Ouse; Thomson, at first dominated by the more restricted hill-girdled lowlands of Roxburghshire, which inspired his "Winter," fell completely under the spell of the softer, richer landscapes of the Thames valley in his "Castle of Indolence." Burns glorified in his verse his native plains of Ayrshire; curiously indifferent to the sea, even to the unrivalled beauty of the peaks of Arran rising across the Firth, he drew his inspiration from the moorlands and, above all, the river-valleys. He sang—

> ". . . auld Coila's plains an' fells,
> Her moors red-brown wi' heather-bells,
> Her banks and braes, her dens an' dells."

The uplands of the country were potent in the inspiration of the grand rough old border ballads, so crowded with feats of daring, and the romance of a wild, lawless life, that the natural features of the background are only commemorated in stray lines and phrases. The border ballads are poems of the dales or river-valleys, in which the various communities were isolated from one another, until they climbed their mountain barriers, or forded the river that barred their glen in front. The peculiar melancholy attached to the valley of the Yarrow, revealed in its full pathos by Scott and Wordsworth, is attributed by Sir Archibald Geikie to the character of the valley itself—the stream meandering along a narrow strip of green, smooth green slopes rising to rounded fells, mottled with bracken and heather, walling off the outer world; and only the murmur of the river on its shingle bars, and the cry of the curlew and plover, to greet the ear.

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* The Romanes Lecture, 1898: 'Types of Scenery and their Influence on Literature,' by Sir Archibald Geikie, D.C.L., F.R.S. Delivered in the Sheldonian Theatre, June 1, 1898. London: Macmillan & Co., Limited. 1898.

The Highlands, rugged in their scenery, raw in climate, rough and bare in their scanty vegetation, are most typically represented in Scotland, although Wales and the English Lake District share all these characteristics in less degree. The genius of Celtic poetry abides in these recesses, and the lecturer selects the Ossianic poems as its expression. While disclaiming any wish to enter into the controversy as to Macpherson's share in these poems, he introduces a shrewd method of criticism which seems to prove that in essence the poems are the genuine outcome of the Western Highlands. Macpherson was brought up in the inland region of Badenoch; the poems are saturated with the scenery of Western Argyll. "The grandeur and gloom of the Highland mountains, the spectral mists that sweep round the crags, the roar of the torrents, the gleams of sunlight on moor and lake, the wail of the breeze among the cairns of the dead, the unspeakable sadness that seems to brood over the landscape whether the sky be clear or clouded —these features of West Highland scenery were first revealed by Macpherson to the modern world." While Scott by his poems and novels turned the flood of touristdom into the Highlands, it is pointed out that his descriptions are those of a stranger attracted to the country and captivated by it, but not imbued with its inner spirit.

The poets of the Lake District are discussed mainly in the person of Wordsworth, whose wonderful insight is referred to, although the marvellous directness and simplicity of the topographical descriptions in his prose writings are not mentioned.

Sir Archibald Geikie truly observes that to treat his great and suggestive subject as it demands to be treated would require not one but a series of lectures; but he has succeeded in giving it an introduction that cannot fail to throw open to many geographical students a new door to regions of far-reaching interest. Modern fiction has derived much of its strength from geographical description; the works of Louis Stevenson, for instance, are more appropriately illustrated by maps than by pictures, and those of Mr. Neil Monro give in modern terms the same first-hand rendering of West Highland nature as appears in the Ossianic poems. There is room for a very profitable extension of the Romanes lecture, and a sequel would be cordially welcomed by all geographers if the graceful and facile pen of the Director of the Geological Survey could but find time to produce it.

ADMIRALTY SURVEYS DURING THE YEAR 1897.

Under the orders of the Lords Commissioners of the Admiralty, eight of her Majesty's vessels with three small hired steam-vessels, manned by 75 officers and 756 men, have been employed on hydrographical surveys on the home and foreign stations. A naval officer, assisted by officers of the Royal India Marine, has also been employed, with the sanction of the Admiralty, under the Indian Government.

The following is a brief summary of the work performed, as detailed in the report prepared for presentation to Parliament.

The number of newly discovered rocks reported show no signs of diminishing, as reports of no less than 190 rocks and shoals, which are dangers to navigation, have been received in the Hydrographic Department, and notified to the public by notices to mariners.

A close examination was made of the entrance to Poole harbour, which showed that the banks on the east side of the channel had undergone considerable alteration; but there was no great difference in the direction or depth of the channel itself.

At Dungeness an examination was made with a view of ascertaining if any alteration had occurred during the last thirty years in the shape of the coast or depths immediately off the point. This examination proved that the high-water line had extended to the east and north-east, but had been cut away to the south and south-west of the point. The position of an alleged shoal north-east of Dungeness was also examined without shoal-water being discovered.

On the coast of Scotland a survey of the Firth of Forth was taken in hand and completed, a sketch-survey of the altered coast-line at Bo'ness was made, and the triangulation of the River Forth between Port Edgar and Alloa was commenced.

On the east coast the following surveys were carried out:—A large scale plan of the portion of the Medway situated outside the lock gates, Chatham Dockyard, was made; a re-survey of the south shore of the River Thames off Blythe sand was completed, the Duke of Edinburgh channel was re-surveyed, the correct position of the North Hinder Lightship ascertained, and the Yorkshire coast from Redcar to the eastward was commenced.

Owing to reports made by the Trinity House, Middle Cross Sand, off Yarmouth, was re-surveyed; the completion of this work showed that very great changes had taken place in the depths in the vicinity. A small portion of the River Orwell was also re-surveyed.

A new survey of Lough Carlingford was made; many shoals not previously charted being found. In the Scilly Isles a survey of Crow, Broad, and St. Mary's sounds was commenced on a large scale.

An area off Great Orme's head that had not been completed the previous season was sounded out, resulting in finding a rock with a least depth of 29 feet water, distant 5½ cables from the headland.

At Portsmouth a re-survey was made of a portion of the harbour and the inner bar. Observations with a current meter were obtained during spring tides to ascertain the velocity of the tide at various depths in the entrance of Portsmouth harbour; the observations were considered to show that the velocity was uniform from the surface to the bottom.

On foreign and colonial shores—on the west coast of Newfoundland the survey of the coast was continued to the north from Daniel's cove, at which point it had been discontinued the previous season, and carried out to Point Rich. The localities of some doubtful soundings in St. John's Bay were examined, resulting in the discovery of a 5½-fathom rock; and two shoals to the northward of Ferolle were correctly charted. The south portion of White bay was also commenced.

In the Atlantic, deep-sea soundings were obtained at certain selected positions and observations made at two positions with a current meter to ascertain the depths and velocity of the equatorial current. The results were somewhat startling, as it appeared that below a depth of 10 fathoms the water was practically still, though running to the westward at a rate of 0·8 knots at the surface; but this result requires confirmation.

On the east coast of South America a running survey was made between the lighthouses of Capes Mogotes and Medano; a line of soundings was also carried over the Abrolhos bank.

In the Magellan strait, a running survey was carried through the Messier channel from Hale cove.

On the west coast of Boca Chica, the channel by which all vessels pass into Aranco bay on their up and down the coast, was examined in consequence of the reported presence of several dangerous rocks. "Hall" rock was correctly charted, and the existence of the "Cockatrice" and "Meteor" rocks disproved. Coronel bay was also re-sounded. Totoralillo bay and the ports of Huasco, Chañaral de las Animas, and Iquique were surveyed. Deep soundings were also obtained outside the very great depths of over 4000 fathoms obtained by the Central and South American Telegraph Company's cable steamer *Relay* in 1890, at a distance of 40 miles from the coast, between the latitudes of Huasco and Chañaral. These soundings showed that the great depression is a narrow trough running parallel to the coast and the chain of the Andes.

Ferrol and Coisco bay, with the soundings off the coast near them, from Mount Division to Santa head, was completed.

Various positions in the Strait of Magellan and west coast of South America were also determined, and magnetic observations were taken at Santa Catharina, Monte Video, Sandy point, Gray harbour, Huasco, and Callas.

In the Red sea unsuccessful searches were made for the reported King Arthur and Akbar shoals at the northern entrance of the Massawa channel; a further examination of the Gannet bank in the same locality was also made.

At Mauritius, a detailed survey of Grand port on a large scale was made, also surveys of Tombeau, Arsenal, and Black River bays.

Soundings were obtained between Mauritius and Coetivy island, also over the Seychelles bank; and a partial examination was made of the soundings to the west of Coetivy island, defining the bank surrounding the island.

In the West Indies a search was made for the Cuidado reef, between Mariguana and Little Inagua, but without success; also for Clarion shoal, said to be situated 15 miles south-west of the south-west end of Great Inagua; the search for this shoal resulted in obtaining a least depth of 234 fathoms; the position of this sounding is now shown as Clarion bank on the chart.

At Jamaica an examination was made of the ship channel between Port Royal and Kingston, proving that there is no practical difference from the original survey.

A search in the neighbourhood of Serranilla bank resulted in the verification of the report of a new reef 10 miles in diameter, and circular in form, the least water being 6¼ fathoms on the north-east side, with a general depth of 15 fathoms elsewhere. It is remarkable that an extensive bank of this description has escaped detection so long.

A survey of Belize, which had been commenced the previous year, was completed; very great differences from the depths shown on the charts being found.

On the east coast of North America, a triangulation of the Strait of Belle Isle was undertaken; 32 miles off the coast of Labrador side was also mapped and plans made of Pinware and Black bays, and Anse à Loup. A meridian distance was also obtained between Bonne bay, Newfoundland, and Forteau bay. At Bermuda an examination of the localities where recent dredging operations had been carried out was made.

In the Pacific one of the surveying vessels made an extensive cruise to Honolulu, *viâ* Palmyra and Fanning islands, to search for reported shoals, survey islands, and obtain soundings at the same time, which would be useful for a Pacific cable. Lines of soundings were carried from Sydney to Fiji, Fiji to Sydney island, to Palmyra island, and northward to a position about 150 miles southward of the Sandwich islands. Also from a position about 360 miles south-east of the Sandwich islands to Fanning island and Suva. Between Suva and Auckland a meridian distance was carried, also a line of soundings run to the eastward of former lines *en route*. From Auckland soundings were taken to Nórth cape and thence to Hobart.

During this cruise, Palmyra island and anchorage was surveyed; Fanning island was surveyed, the soundings being carried out to a sufficient distance to delineate the 1000 fathoms' contour line, also plans made on large scales of English harbour and Whaler anchorage. Ringman reef and Tavuini bank were examined; Caldew reef, Maria and Diana shoals were searched for unsuccessfully. From Fiji a line of soundings was run through the Nanuka passage, and thence to the reported positions of the various banks lying near the parallel of 12° S., and extending over several degrees of longitude. Of those searched for, the Lalla Rookh, Robbie, Adolph, Turpin, and an unnamed shoal was found, as well as two more banks, which received the names of Home and Tuscarora. These banks rise from a general depth of 2500 fathoms, and are of the usual coral formation, some of considerable size, varying between 3 and 20 miles across. The larger ones show the submerged atoll form, the smaller are flat, varying from 9 to 20 fathoms over them. The general depths of the former are from 25 to 27 fathoms, with a shoaler rim. No danger was found on any of them.

On the coast of South Australia, Esperance bay was surveyed, also the approaches. This bay is the nearest point on the coast-line to the West Australian goldfields, and the town is increasing rapidly.

On the Queensland coast the survey was resumed inside the barrier reef, northward of Cooktown, and a good passage examined through the Barrier between Stapleton island and No. 1 sand bank. A line of deep-sea soundings was also obtained outside the barrier reef from Cook passage to Grafton passage, where no information existed before as to the depths. A triangulation from Night island, south to Cliff island, a distance of 70 miles, was completed, and the survey of the inner route proceeded with.

The coast from Wedge bay to Port Arthur, in Tasmania, which was commenced the previous season, was completed, the soundings being carried out 12 miles off the coast.

In India, the positions of the Krishna shoal and Baragua light vessels, off the Irrawaddy, were accurately determined, and an unsuccessful search made for the "Vita" shoal, reported by the s.s. *Vita* to be 9 miles south-west of the Krishna shoal higher up.

The work of resounding the gulf of Martaban was commenced; the depths were found to be considerably different from what was shown on the chart, thus confirming the report forwarded from time to time by vessels frequenting the gulf.

In the Andaman, the surveys of the Cleugh passage and the Coco channel were proceeded with. Large-scale plans were also made of Madras harbour and the entrance to the Bombay docks.

During the year the Hydrographic Department has published one hundred and thirty-two new charts and plans, and improved eighteen plates by the addition of twenty-six new plans; 280 plates have been largely improved by corrections and additions; 4390 corrections have been made to plates by the engraver; and 32,567 charts have received minor corrections at the hands of the draughtsmen.

The number of charts printed for the requirements of the Royal Navy, for government departments, and to meet the demand of the general public, has, during 1897, amounted to 365,657.

THE ANGLO-FRENCH BOUNDARIES IN WEST AFRICA.

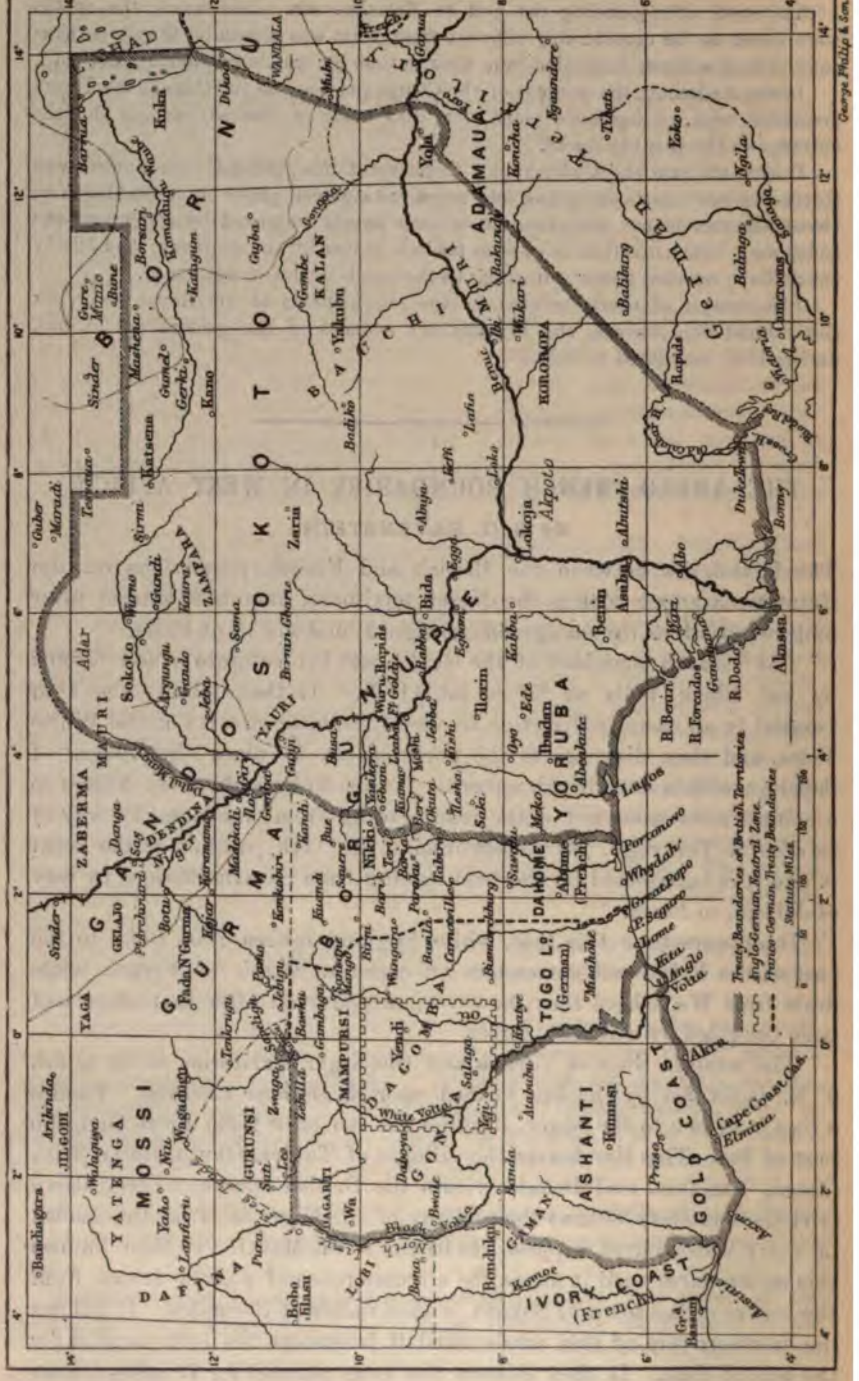
By E. G. RAVENSTEIN.

The boundaries between the British and French possessions on the Guinea coast and within the Niger territories have been settled, after long negotiations, by an agreement signed on June 14 at Paris.

The western boundary of the Gold Coast Protectorate is now formed by the Black Volta as far as lat. 11° N. It then follows the 11th parallel in an easterly direction to one of the head-streams of the White Volta, and then diverges to the north, so as to place the village of Sapeliga within the British sphere. It then follows the river Nuhau to a point 2 miles eastward of the road leading from Gambaga, by way of Bawku, to Terkrugu. It finally rejoins the 11th parallel at the point where it is intersected by the road leading from Sansane Mango, by way of Jebigu, to Pama.

It appears from this that, while England retires from Bona to the east of the Volta, and surrenders all claim to Mossi, the French withdraw from Wa, where they, however, only arrived after that place had been occupied by a British force.

The western limit of Yoruba and the Niger territories, as far as lat. 9° N., is formed by the line agreed upon on October 12, 1896. Thence a line is drawn to the Niger, 10 miles (as the crow flies) above Giri, the port of Ilo. This line leaves the villages of Tabira, Okuto, Boria, Teri, Obani, Yasikera, and Dekala within the British sphere. From above Giri the boundary follows the midway of the Niger as far as the mouth of a dry watercourse, supposed to be the Dalul Mauri. It then follows this watercourse until it meets the circumference of a circle drawn from the centre of the town of Sokoto, with a radius of 100 miles. It follows the northern arc of this circle until it intersects the 14th parallel for the second time. It then follows the 14th parallel for 70 miles; then


BORNU
SOKOTO
GURMA
GANDO
BORGU
NUPE
YORUBA
ADAMAUA
MOSSI
GURUNSI
MAMPURSI
GONJA
ASHANTI
GOLD COAST
IVORY COAST (French)
TOGO Lᴰ (German)
DAHOME (French)
Lagos
Lake Chad
Kuka
Kano
Katsena
Sokoto
Zaria
Bida
Ilorin
Lokoja
Yola
Benue R.
Niger
Benin
Akassa
Bonny
Duke Town
Cameroons
Akra
Cape Coast Cas.
Elmina
Kumasi
Salaga
Yendi
Sansanne Mangu
Say
Wagadugu
Treaty Boundaries of British Territories
Anglo-German Neutral Zone
Franco-German Treaty Boundaries
Statute Miles
George Philip & Son.

descends due south to lat. 13° 20′ N.; then eastward along this parallel for a distance of 250 miles; then regains the 14th parallel, and follows it as far as a meridian, passing 35′ east of Kuka; and ultimately this meridian southward, until its intersection with the southern shore of Lake Chad. As Kuka, according to Monteil, lies in 13° 25′ E., this meridian passes 14° E. of Greenwich, and coincides with the boundary laid down in the Anglo-German agreement of 1893 (see *Geographical Journal*, vol. iii. p. 43). France, moreover, expressly recognizes the boundary just referred to as binding her.

On looking at our map, it will be seen that France surrenders her stations of Busa, Gomba, and Ilo, on the Niger. England, on the other hand, not only surrenders Nikki, with the greater portion of Borgu, but also the greater part of Gando, which has always been looked upon as a vassal state of the empire of Sokoto. The northern boundary now assigned to the empire just named does not include the whole of the territories which are usually claimed for it, whilst Sinder and Munio (Gure), belonging to Bornu, have been surrendered to France.

By Article VIII., the British Government agrees to lease to France for thirty years two plots of land on the Niger; the one, on the right bank, between Leaba and the mouth of the Moshi; the other, at one of the mouths of the Niger. The river frontage of each of these plots shall not exceed 400 metres in length, nor the total area 50 hectares (123 acres). This lease conveys no territorial rights, and practically limits France to the erection of bonded warehouses upon the lands leased.

Article IX. defines an area within which British and French subjects and protected persons shall be treated on equal terms in all matters of trade and navigation. This territory includes the Ivory Coast, from Liberia as far as the Gold Coast Protectorate; the region to the eastward, as far as the new boundary of the Niger territories, to the south of lat. 11° N.; the whole of the British Niger territories; and, finally, a triangular district, the apex of which is Wagadugu, the capital of Mossi.

Our map is based upon the maps attached to the agreement. Most of the places mentioned during recent controversies have been inserted upon it.

THE MONTHLY RECORD.

THE SOCIETY.

Antarctic Exploration.—In October last, the President, on behalf of the Council, wrote at some length to the Prime Minister, urging upon Government the necessity for a renewal of antarctic exploration by this country, and pressing upon his lordship the duty of England to complete the work begun by Ross half a century ago. This letter was acknowledged in a way that inspired the Council with a hope that

Government would undertake the much-needed task. Unfortunately, a final reply has been received from Lord Salisbury, stating that he cannot hold out any hope of Her Majesty's Government "embarking upon an undertaking of this magnitude," and that, from a communication which has been received from the Australian Colonies, there is no prospect of any joint action in that quarter. As the Council are strongly impressed with the feeling that it is the duty of this country to undertake the exploration of the great unknown antarctic region, and not to leave it to other nations, they have authorized the President to take steps to obtain the necessary funds, not less than £50,000, towards which the Society will contribute £5000.

EUROPE.

The Vernagtferner.—The German and Austrian Alpine Club announces the beginning of a new series of scientific publications in the form of *Ergänzungshefte*, or supplementary numbers of the Club's *Zeitschrift*, similar to those published by *Petermann's Mitteilungen* and the *Geographical Journal*. An excellent start has been made with a monograph on the Vernagtferner (Vernagt glacier) by Dr. S. Finsterwalder, of Munich, and the immense activity with which research in all branches of physical geography is now being carried on both in Germany and Austria, affords good prospect that this paper will be followed by others of equally high merit. If we take the valleys of the Inn, the Oetz, the Passeier, and the Etsch as the bounding-lines of the Oetzthal Alps, we have a figure with the Vernagtferner placed almost exactly in its centre of gravity. The Weisskamm, the main ridge of the system, marked out by such summits as the Weisskugel, the Fluchtkogl, the Hochvernagtspitze, the Hinterer Brochkogl, the Wildspitze, and the Schwarze Schneide, has a general trend from south-west to north-east, but between the Fluchtkogl and the Hinterer Brochkogl it sweeps round in a curve concave southwards, and a kind of amphitheatre is completed by two minor ridges running south-east from the Fluchtkogl to the Vordere Guslarspitze, and south from the Hinterer Brochkogl to the Platteikogl. The oval basin thus enclosed has an area of about 7½ square miles; it drains to the Vernagtthal, and forms the snow-field of the glacier. It is divided unequally into two areas, one about three times the size of the other, by the rocky Hintergraslkamm; the larger is the Hochvernagtferner, the smaller the Guslarferner, and each has a small semi-independent bay, known as the Klein-Vernagtferner and the Klein-Guslarferner respectively. From the point of junction of the two main branches at the Hintergrasl, the Vernagtthal extends downwards for about a mile as a steep gorge, some 500 yards wide and 700 feet deep, with precipitous sides, and enters the Rofenthal almost at a right angle. The Vernagtferner thus appears as a perfectly definite system; the limits of its basin are clearly outlined, and the whole drainage must pass through a single narrow channel. Hence the conditions are favourable for exact measurements, which can be repeated from time to time in such a way as to allow of easy comparison with one another; and the extreme scientific, as well as practical, interest of such measurements, arises from the fact that whereas at certain periods the end of the glacier has been known to retreat to such an extent that the Hoch-Vernagtferner and the Guslarferner have become actually separate, at others it has advanced down the whole length of the Vernagtthal and crossed to the Zwerchwand opposite, completely blocking the Rofenthal, damming the Rofener Ache which flows through it, and forming a lake which may have been as much as 1200 yards long, 300 yards broad, and 600 feet deep. The formation of such a lake naturally leads, sooner or later, to an outburst causing immense damage in the lower parts of the Rofenthal, in the Oetzthal, and even in the Innthal; such catastrophes occurred in the years 1600, 1680, 1770, and 1845. The brief description just given will suffice to show that Dr. Finsterwalder has undertaken a work well worth doing. His report is divided into three main parts. The first describes the general topography of the Vernagtferner, and summarizes the results of an exhaustive critical examination of the information extant about the movements of the glacier and its moraines in the past. The second consists of a detailed account of a minute special survey of the region made by Drs. Finsterwalder, Blümcke, Hess, and Kerschensteiner in 1889, and furnishes an excellent model of what such surveys should be, especially with regard to the application of photography, and to the methods of reduction of data; upon this is based a large-scale map. The third and longest section is devoted to analysis of the results of the two preceding, and applications to the general questions of glacier motion. It is impossible to give even the main drift of Dr. Finsterwalder's conclusions here, but it may be said that they derive special interest and value from the mode of discussion, which omits all assumptions involving friction, regelation, etc., and deals simply with the geometrical idea of stream-lines. An important appendix, with subsidiary maps, describes further partial surveys of the glacier made by Drs. Blümcke and Hess in 1891, 1893, and 1895, and compares the state of affairs at those dates with the main survey of 1889. In 1895 the extremities of the Hoch-Vernagtferner and the Guslarferner were entirely separated, having retreated to what must be nearly a minimum position, as the upper parts of the ice-streams had in the same time increased in height by about 30 feet. The final complete explanation of the extraordinary changes taking place in this glacier will probably not be forthcoming until the next maximum, which may be expected about a quarter of a century hence. We may wish Dr. Finsterwalder and his colleagues the happiness of being able to continue their watch upon its vagaries until their labours are thus crowned; meanwhile they hazard the suggestion that on account of peculiarities in the shape of the basin, parts of the "Firn"-area really lie dormant, and contribute nothing to the glacier ice, except under prolonged conditions of unusual severity, such as may occur during the "cold-periods" of Brückner. It must be admitted that the dates of the formation of a lake in the Rofenthal correspond temptingly with those of Brückner's minima, if we allow even a modest interval for cause to take effect.

AFRICA.

Journey in the Galla Countries South of Shoa.—An important journey has lately been made by a French traveller, M. Darragon, through some of the least known Galla countries south of Shoa. An account of it appears in the *Comptes Rendus* of the Paris Geographical Society (1898, No. 3). Entrusted by King Menelik with a mission to the Borana Gallas, M. Darragon proceeded south through Gurage, and reached the Borana country by a route to the east of the Lake Pagade, discovered by Captain Bòttego, thus for the first time connecting the itineraries of travellers from the north with those from the east through Southern Somaliland. His delineation of the chain of lakes, of which Pagade is the largest, differs considerably from that of previous travellers. South of Lake Ororosha, or Shahalla, which has hitherto appeared on our maps as the southernmost of the Zuai group, he places a small lake, Abbasi, north of Pagade. This may be the Lake Abbas first mentioned by D'Abbadie, but as the name, in one form or another, appears to be applied to any large body of water, any of the other lakes of this region may equally well have been the one referred to. East of Lake Abbasi M. Darragon places a range of mountains running north and south, which he considers the continuation of a range found by him to run in the same direction east of Lake Pagade, in the Sidama country. These mountains seem to reach a considerable altitude, as M. Darragon places some of his camping-stations at heights of 9000 feet and more. In the Amara country, further south, the French traveller reached ground already traversed by Dr. Donaldson Smith. Both Sidama and Amara are fertile countries, covered in their upper parts by impenetrable forests. The inhabitants, Gallas, are now subject to Menelik. On reaching Sogida, in the Borana steppe, where not a drop of water was found for 50 miles, M. Darragon retraced his steps, crossing the Sagan, or Sageun, and returning through the countries west of Lake Pagade. In Konso the inhabitants were quite black, and were remarkable for their industry. They have lately been made subject to the Abyssinians. After passing through several mountainous districts, the traveller reached Walamo, which occupies an immense plain dominated by Mount Damota. The Omo was but a short distance to the west, but M. Darragon did not visit it, nor could he gather any information about it, but, from the direction of the mountains, it seemed to take a westerly course. The Wera, or Billati, apparently the Waira of our maps, flows, according to M. Darragon, into Lake Pagade, from which issues the Sagan, the feeder of Lake Stefanie. According to Bòttego's companions, however, the effluent of Lake Pagade enters the Lake Abbaja of Dr. Donaldson Smith, which lies to the south-west of Pagade.

Count Wickenberg's Journey in Somaliland.—On his return from a hunting and exploring trip to Somaliland, carried out in the latter half of 1897, Count Wickenburg handed over his notes and scientific observations to Prof. Paulitschke, who now contributes to *Petermanns Mitteilungen* (1898, No. 3) a short account of the journey, accompanied by a map on the scale of 1 : 1,000,000. Although Count Wickenburg's first idea of penetrating to Lake Rudolf (*Journal*, vol. x. p. 328) was abandoned, owing to the opposition of King Menelik, the Austrian traveller succeeded in filling up several blanks in the map of Northern Somaliland. Starting from Berbera on June 24, Count Wickenburg proceeded at first south-west to the valley of the Tug Der, explored in 1896–97 by Messrs. Parkinson, Brander-Dunbar, and Aylmer. Arrived at Bur Dap, an important trade-centre near the low hills of the same name, also explored by the British travellers, the count turned in a south-westerly direction across the district of the Dolbohanta Somalis, hitherto unvisited by white men, to Fafanjer in Ogaden. Bur Dap lies at the north-east edge of the waterless Haud plateau, the eastern part of which had to be crossed by this route. Much of the country was uninhabited and covered with thorny bush, but parts were open and well grassed. The Dolbahanta are the most independent of the tribes within the British protectorate, and they assumed an arrogant demeanour towards the travellers. The Arsama Ahmed, one of their sections, are rich in horses, and undertake raids on Ogaden for the purpose of stealing camels. Before reaching Fafanjer (where there is a series of pools which contain water most of the year) the caravan suffered severely from thirst. The watering-place is not now in British territory, and the Bachawadle of the neighbourhood have already been put under contribution by the Abyssinians. The route now led west, thick bush alternating with dry red sandy soil, and afterwards giving place to the open grassy plains of the Rer Harun. After exploring the Tug Jerer and two other branches of the Tug Faf, in a thickly populated district, Count Wickenburg proceeded south to Omen, and thence north-west through a mountainous and waterless region to the Sulul, which he explored for a considerable distance above its confluence with the Dakatto. Its bed, which contained no running water at the time, is deeply eroded between banks 30 feet high, the adjacent plateau being covered with grass and bush, and supporting large herds of *Equus grevii*. Again reaching the Jerer, and ascending it for some distance, the Count crossed the Haud by a new route to Hargeisa, and continued his way thence to Berbera. The Abyssinians appear to have firmly established their sway over all the tribes along the Jerer visited by Count Wickenburg. Prof. Paulitschke records the meteorological observations made by the Austrian traveller, and discusses the data used in the construction of the map. Count Wickenburg has lately been engaged in scientific work near Mount Kilimanjaro.

Surveys in German East Africa.—The first number of the *Forschungen aus den Deutschen Schutzgebieten* for the present year contains a map by Dr. R. Kiepert and Max Moisel, which helps to fill in one of the most important blanks hitherto existing in the map of German East Africa. The region in question is that lying south-west of Ugogo, and north-east of Lake Rukwa, about which little has been known, with the exception of some vague information collected by Burton in 1858. It was traversed in part in 1895 by Captain Prince, who, starting from Kilimatinde, in Ugogo, made a wide circuit to the south-west, reaching as his furthest point west a place called Kwikuru-kwa-Mtsavira, in the district of Kiwere. In 1896–97, Lieut. Stadlbaur surveyed a route through the district of Itumba, lying chiefly to the south-east of Prince's route, and it is on the work of these two travellers, supplemented in part by information supplied by Lieut. Kielmayer in 1897, that Dr. Kiepert's map is based. The whole of the region, between 5° 30′ and 8° S., is inhabited principally by the Wakimbu, the chief district being that of Itumba, which embraces a considerable area under the suzerainty of the chief Guluwala. South of Itumba lies the independent district of Iringa, inhabited by Wakimbu and Wagogo. Dr. Kiepert considers it doubtful whether or not the Wakimbu countries should be included under the general name Unyamwezi, which, moreover, is not used by the people themselves, the country so-called consisting of a number of independent districts. According to the map, the Wakimbu country is drained chiefly towards the Rufiji, though Kiwere is traversed by a stream flowing towards Lake Rukwa.

French Expeditions to Lake Chad.—News has been received in Paris from M. Gentil, leader of the expedition sent out three years ago for the purpose of placing a steamer on the Shari and Lake Chad, announcing his successful descent of that river and arrival at the open water of the lake. Before proceeding thither, M. Gentil ascended the Bahr Erguieg in the *Leon Blot* to within 10 miles of Massinia, the capital of Baghirmi, where he met with a cordial reception from the Sultan. Although Rabah had established several garrisons on the lower Shari, he had not completed the subjection of Baghirmi, where the population is eager to take vengeance on the adventurer for the cruelties committed by him. The fortified posts on the Shari might have proved dangerous obstacles in the way of an advance to the lake, but the garrisons fled on hearing of the arrival of "Crampel's brothers," Rabah having been, it is said, the instigator of the murder of that traveller. Gulfei, one of these posts, on the left bank of one of the branches of the Shari, has walls forming a square of nearly 3 miles, with two projecting forts. Its population is about 10,000. The open water of Lake Chad was reached on November 1, and it presented the appearance of a veritable sea. A number of islands block the entrance of the river, and nothing is to be seen but grass, reeds, and papyrus. No firewood is to be obtained on the shores of the lake, but there is abundance on the banks of the lower Shari. Scarcity of supplies prevented the complete exploration of the lake, and M. Gentil returned to Baghirmi and the Gribingi, whence the letter lately received was written. As the geographical results of the expedition,

M. Gentil mentions the survey of the course of the Gribingi and Shari; the discovery of the mouths of the Ba N'Goru, of the Bakari, and of a river which connects with the Bahr Salamat; the examination of the Bahr Erguieg as far as a place called Maggi; and the quasi-demonstration that the Logone is only a branch of the Shari. The Gribingi is only a tributary, and not one of the main branches, having a breadth of little over 70 yards at the confluence, whereas the Shari is three times as wide and much deeper. M. Gentil has since returned to the coast.

Dr. Hans Meyer's New Expedition to Mount Kilimanjaro.—*Globus* (vol. 73, No. 21) announces that Dr. Hans Meyer has undertaken a third expedition to Mount Kilimanjaro, and that he was to start in June, accompanied by an artist, Herr Platz. He hopes to fill in some of the gaps which, in spite of his own work and that of other travellers, still exist in our knowledge of the mountain, especially with regard to its northern slopes. Among the points to be studied are those of the former glaciation of the mountain, the distribution of Alpine plants, the features of the Mawenzi crater, etc. The expedition is expected to last six months.

French Scientific "Protection" in Madagascar.—The *Politique Coloniale* of May 25, 1898, publishes a circular addressed by General Gallieni, the French governor of Madagascar, to the local officials of the island, in which he states that past explorations have demonstrated the existence of fossils of great scientific value in the soil of the island, and that the unexplored regions may be expected to yield equally interesting results. The general goes on to say that he thinks it a matter of national interest to reserve to his countrymen the benefits of extracting fossils in the future, too many having already passed into the possession of foreigners; and he states that no fossil-collectors will be tolerated unless provided with a special licence from the governor-general. He concludes by enjoining on the various provincial officials the importance of informing the natives of the new prohibition. This order occasions the more surprise on account of the fact that the Government of France is famous for the encouragement it gives to French scholars and men of science to carry out archæological and scientific surveys, and make collections in other countries. It would be a loss to science, and particularly to geography, if French explorers were henceforth to be prohibited from straying beyond the territories administered by the Republic, yet this is the logical outcome of the policy now inaugurated in Madagascar, a policy which other governments may adopt in an imitative, if not in a retaliatory, spirit.

AUSTRALASIA AND OCEANIC ISLANDS.

Geographical Distribution of Vertebrates in Victoria.—A paper by Mr. A. H. S. Lucas, on "Some Facts in the Geographical Distribution of Land and Fresh-water Vertebrates in Victoria," appears in the latest volume (vol. ix., New Series) of the *Proceedings* of the Royal Society of Victoria. The subject is mainly dealt with in a series of tables, in which, for purposes of comparison, the distribution of Tasmanian forms is included as far as known. From the zoological facts, some definite conclusions may be formed as to the relative age of the two barriers—the Bass straits and the Dividing range. As is pointed out, Bass straits in its present condition must have presented a very formidable barrier to the passage of all land and fresh-water vertebrates unfurnished with wings; while the Dividing range has been felt in its action on the rainfall, two widely divergent climatic conditions having thus been produced—a humid region in the south-east, and a dry region in the north-west; hence, two faunas suited to the two regions. The marked distinctness, frequently extending to the genera, of the faunas of the north-west plains and the well-watered south-east hill and coast country, points to the long persistence and ancient origin of the Dividing range. So, going on the zoological evidence only, it seems clear that the Bass straits were formed sufficiently to serve as an effective barrier before the dingo and the most highly differentiated tree-forms reached Southern Victoria, and after the forests had been established and the streams stocked with the existing fish, long after the separation or evolution of the two Victorian faunas had taken place. During the process of widening and deepening of the straits, the dingo invaded Victoria, the thylacine and Tasmanian devil disappeared, while the koala and flying opossums came in from the north along the eastern strip of Australia, and made their habitat in the Gippsland forests along with the fruit-eating bats, and, speaking generally, the present distribution of vertebrates in Victoria has been effected.

The Ramu Expedition, German New Guinea.—It is announced in *Globus* (vol. 73, No. 21) that the expedition sent out under Lieut. Tappenbeck to explore the Ottilien river with a steamer, and complete the work of the former expedition under Dr. Lauterbach, has been successful in proving the identity of the Ramu, discovered in the interior by the latter, with the Ottilien, which enters the sea a little to the east of the mouth of the Kaiserin Augusta. The stream was ascended for a distance of 125 miles, and an important waterway leading into the centre of the German territory has thus been discovered.

Publication of Baron von Schleinitz's Survey of the Coast of New Pomerania.—The *Zeitschrift* of the Berlin Geographical Society (1897, No. 6) contains a paper by Baron von Schleinitz, accompanied by a map on the scale of 1 : 500,000, on the results of the surveys of the coasts of New Pomerania (formerly New Britain) carried out by him in 1887. Although the general results were made known at the time, no full account seems previously to have been published. The most important discovery made by the German admiral was that the land lying northward of the central part of the north coast, instead of forming islands as was thought by D'Entrecasteaux during his voyage of 1793, and as had been shown on all maps since that date, really formed a much indented volcanic peninsula. Some doubt seems to have existed as to the correctness of von Schleinitz's statement, for some recent maps (*e.g.* Kiepert's Deutsche Kolonial Atlas) have still shown the land in question as consisting of islands. In his lately published map, von Schleinitz carefully distinguishes between the coastline actually seen by himself and that derived from other surveys, and though the whole of the coast of the peninsula was not followed, there seems little room for doubt that he is correct in his statement. The shores of the whole eastern half of New Pomerania are carefully described in the paper, special attention being paid to the position of dangers to navigation, and useful information is given as to the surface features visible from the coast. A considerable stream appeared to debouch on the north coast a little east of 151° E., while the plain to the east of it, sloping up to the group of volcanic peaks clustering round the "Father," seemed a promising field for plantations. In his map the writer has introduced the correction in the delineation of the coast-line shown to be necessary by recent astronomical observations at Matupi island, in Blanche bay.

Visits to the Shortland Islands, Solomon Group, and the Coast of German New Guinea.—The issue for 1897 of *Nachrichten über Kaiser Wilhelms-Land*, etc., contains a short account of a visit to the Shortland islands, lying off the south end of Bougainville, in the German portion of the Solomon group, made by Dr. Hahl during his cruises with the government police force. The islands are all of volcanic origin, and have, as a rule, a small elevation in the centre. There is an excellent harbour at Faisi. All the land is covered with dense forest, species of hard woods being apparently abundant. The soil beneath the surface layer of humus consists of yellow clay with grey sand beneath. The population, which is fast decreasing, does not appear to exceed nine hundred, the main island being quite uninhabited, though used for plantations. The chiefs have submitted to the German Government. Dr. Hahl afterwards visited the east coast of New Pomerania, where the inhabitants were very shy, and also the south-east coast of German New Guinea, near the British frontier. At Traitor bay some miners were found, who had penetrated as far as Mount Scratchley, but without obtaining much gold. The inner part of the bay, the only portion of use as an anchorage or landing-place, falls within the British sphere, while the Ikore river, which is in German territory, cannot compete with the Mambare as a route to the interior. A good view was obtained of the interior mountains, the western portion of which extends into the German sphere.

POLAR REGIONS.

Captain Sverdrup's Expedition.—Some further details respecting Captain Sverdrup's forthcoming expedition to the north of Greenland have lately been published by the *Times*. The *Fram* has been partially rebuilt and refitted for the purposes of the expedition, a sum of money sufficient to cover the cost of the alterations having been placed at Captain Sverdrup's disposal by the Norwegian Government, whose property the ship is. For illumination and cooking purposes twenty tons of petroleum are being taken, thus reducing considerably the amount of coal required. Stores for sixteen men for about four years have been provided, whilst a depôt of coal, together with relays of dogs, has already been got ready at Godhavn and other places in Greenland. It is hoped that Robeson channel may be reached by August, the month in which it will be most free from ice. Winter quarters will be sought on the north-west coast of Greenland, and the various members of the expedition will study the different forms of arctic life and phenomena, and explore the surrounding country by means of sledge-journeys. The staff will include the following: astronomer, Lieut. Victor Baumann; cartographer, Lieut. Ysachsen; meteorologist, Dr. Svendsen; zoologist, Dr. E. Bay; botanist, Dr. H. S. Simmonds; geologist, Dr. P. Schei. The expenses of the equipment, etc., are being paid by Consul Axel Heiberg and MM. Arnund and Ellef Ringnes.

Mr. Wellman's Polar Expedition.—Mr. Wellman's plans for a new expedition to the polar regions have now taken definite shape, and have received the approval of the National Geographic Society of Washington and of the United States Coast and Geodetic Survey and Weather Bureau. The scientific staff will include officers of both these government departments, viz. Mr. Q. Harlan, who goes as physicist, and Mr. E. B. Walker, meteorologist and geologist. The latter accompanied Peary to Greenland. Dr. E. Hoffma will accompany the expedition as medical officer and naturalist; while Prof. J. H. Gore will go as far as Franz Josef Land, for the purpose of making pendulum observations. A charter of the Norwegian steam-whaler *Fridtjof*, said to be the strongest ice-steamer in Norway, has been obtained, and Mr. Wellman hoped to start from Tromsö about the end of June. Experienced Norwegian ice-pilots have been engaged, including Paul Bjorvig, who accompanied Mr. Wellman to Spitsbergen in 1894, and also went with the Andrée search-party to the same country last autumn. Bernt Bentzen, one of Nansen's crew on the *Fram*, will also go with the expedition. At Archangel seventy-five draught dogs, specially procured from Siberia, will be taken on board. Thence Mr. Wellman proposes to steam for Cape Flora, in Franz Josef Land, where a supply station will probably be established. Pushing on to the north of the archipelago, the party will, according to present plans, winter between 82° and 83° north, making a renewed start with sledges in February, 1899. A special feature will be the use of small sledges capable of being drawn by a single dog. They will be made on an entirely new plan, a tube-like construction of tinned copper being provided with runners on its two sides, and so shaped that if it tilts over it always comes down on one or other pair of runners. It will be air-tight, and will float in water. As the supplies stored within are needed, the tube will be ripped open and discarded. Fifty of these sledges, weighing little over 100 lbs. each, will be taken, as well as a small canvas boat in which to cross possible channels and water-holes, and also to provide shelter by night. Allowing an average rate of 10 miles a day, Mr. Wellman hopes that it may be possible to cover the distance to the pole and back, roughly a thousand miles, by the beginning of June, at which time the melting of the snow makes travel exceedingly difficult. It will be seen that every precaution has been taken to make the expedition a success, but how far this will be attained will of course depend on the nature of the surface to be travelled over.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

M. de Lapparent's 'Physical Geography.'—Prof. de Lapparent has just issued a second edition of his important work on physical geography,* the first edition of which was noticed with some detail in the *Journal*, vol. viii. (1896) p. 65. It is extremely satisfactory to find that a book of so original and so thoroughly scientific a character has proved such a success as to require a new edition within two years. The opportunity has been taken, not only to revise the text and to introduce a large number of additional illustrations, but also to enlarge the work by the addition of two new chapters; although unfortunately, the book still lacks that essential aid to the student, an alphabetic index. The new chapters deal with the oceans and with the classification of mountains. The former summarizes very briefly the main facts of oceanography, so far as regards the relief of the floor of the oceans and the chief currents, in the light of the most recent researches. The chapter on mountains is more important. The author confesses that he looks with mistrust on the multiplication of new terms unless to express ideas which are truly and entirely new, and that he does not wholly approve of classifications, the distinctions of which are apt to prove more apparent than real. He protests against the abuse of genetic relations, insisting that in geography an actual plateau must not be called a mountain because it has been produced by erosion from some previously existing mountain. He ingeniously defines a mountain as a land-form to reach the summit of which one must *mount* up from every side. The terminology introduced by Prof. Supan is, in Prof. de Lapparent's opinion, unsuited for translation into French, and if this be the case, it is unsuited for direct translation into English also, much as one could wish the case to be otherwise. Prof. de Lapparent prefers to classify mountains into three genetic groups, according to their formation by *accumulation* (volcanic, glacial, or æolian), *deformation* (laccolites, folding, or dislocation), and *erosion*, subdividing each group into types represented by the name of some locality. The question is a very interesting one, and the last word on either side has yet to be said.

The Determination of Geographical Positions without Astronomical Instruments.—An important addition has been made to the long series of

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* 'Leçons de Géographie Physique par Albert de Lapparent.' Deuxième Edition, revue et augmentée avec 163 figures dans le texte et une planche en couleurs. Paris: Masson et Cie., 1898. Pp. 718.

"Erganzungshefte" of *Petermanns Mittheilungen* by the publication of No. 123, a paper by Prof. Dr. Paul Harzer, of Kiel, on methods of determining latitudes and longitudes without the use of the delicate astronomical instruments so troublesome to the traveller. The first part of this excellent monograph is devoted to a statement of the astronomical problems to be solved in ascertaining positions; the observations required, and the methods of their reduction, are explained by the help of mathematics which should not be beyond the reach of the ordinary student, special attention being directed to the calculation of the values of errors. This enables the reader to understand the use of the simple apparatus described in the second part of the memoir. Four upright posts are fixed in the ground, and on these, at a convenient height, a light wooden frame in the form of a parallelogram is supported. A string is passed over the two longer sides of this frame, and to the free ends a weight of one to two pounds is attached, the weight being immersed in a bucket of water so as to bring the system to rest as quickly as possible if disturbed by wind. The string thus forms a triangle which remains in a vertical plane, and the frame is so placed that this plane does not form any considerable angle with the meridian. Similar triangles may be placed on each side of the central one, with their planes conveniently arranged so as to radiate from the observer. The strings are whitened with chalk if necessary, and illuminated by means of a lantern placed on a table at the side. Observations, of course, consist in timing the passage of the moon or selected stars across the triangular planes of the strings. Dr. Harzer gives a full series of typical observations, and examples of the mode of working them out and estimating errors, and he obtains much more satisfactory results than might have been expected from the crude apparatus employed. The last part of the memoir gives a brief recapitulation in a form suitable for practical work.

GENERAL.

University Teaching of Geography in Belgium.—The New University of Brussels has issued a short statement of the plan of teaching in its Geographical Institute, which was founded in March, 1898, under the direction of M. Elisée Reclus, who is assisted by eleven specialists. The New University is a body entirely free from external control, and has planned the geographical course "in what appears to be the most logical order, conformably to the ideals of every geographer who would be at the same time a man of science, a scholar, and a good worker." The programme is formidable, demanding preliminary courses in natural history, chemistry and physics, mathematics, elementary geography, history, the English, German, Russian, and neo-Latin languages, and drawing. Latin and Greek, however, are not required. The first year at the Geographical Institute demands fifteen hours per week, of which three hours are devoted to mathematical geography, two hours each to physical geography, languages, and drawing, and one hour each to cosmography, meteorology, geology, biology, photography of maps and reliefs. The course commences with a lecture on the position of geography amongst the sciences, and excursions are prescribed for the holidays. In the second year, three hours a week are shared between cosmography and mathematical geography; four hours are given to drawing, including map-construction; two hours each to physical geography, geology, and languages; and one hour each to botanical geography and anthropology. The third year demands three hours a week for the history of geography; two each for comparative geography, commercial geography, and the construction of maps; and one hour a week for each of the following: geodesy, geology, zoogeography, anthropology, medical geography, ethnography and colonisation, toponymy, or the science of place-names.

The holidays are to be occupied by excursions and "the science and practise of exploration." The scheme certainly appears to be both thorough and complete, although the allocation of time may possibly be found capable of improvement. The regular students of the Institute will be expected to write memoirs, as part of their training, when sufficiently advanced, and to draw maps, which may be published by the Institute and become its property. This effort to establish a great school of geography will command the sympathy of geographers, who will look forward with interest to the results of the experiment.

System of Orthography for Native Names in the Congo State.—A few years ago the *Mouvement Géographique* published a system of orthography to be followed by that journal in dealing with native names of places. This has been generally followed also by the officers of the Congo State, and an official note has now been issued, laying down general rules for the spelling of place-names, in which the former system has been slightly modified and made more simple (*M. G.* 1898, No. 11). All the vowels except *u*, and thirteen of the consonants, are pronounced as in French, while *u* has the sound of the French *ou*. So far the system agrees with that laid down by the Royal Geographical Society, except that *j* is pronounced as in France, and *dj* is used for the sound of that letter in English. For the long sound of the vowels the circumflex is employed. As regards the other letters, the system harmonizes on the whole with that of our Society; thus *c*, *q*, *x*, *ph*, are discarded, *g* is always hard, *s* has the sharp hissing sound, and *sh*, *w*, and *y* are used as in English. The combination *ch* is not employed, however, its sound being shown by the use of *tsh*, while *dsh* is also allowed as distinct from *dj*; double consonants, again, are not allowed. Stress is laid on the distinction between *wa*, *we*, etc., and *ua*, *ue*, etc., the latter representing two distinct vowel sounds in juxtaposition. Rules which apply specially to Africa are (1) that by which the prefix is discarded in such names as N'Doruma, and (2) that which forbids the use of the terminal *s* to denôte the plural in names of tribes. The system has the advantage of being consistent throughout, the same sound being always represented by the same symbol. This holds even in the case of the compound sounds *tsh* and *dj*, whereby the use of special symbols, as in English, is obviated. No provision is made, however, for the representation of certain sounds of which account is taken in our system, *e.g.* those represented in English by *aw* (as in *lawn*) and *th*, while both systems alike fail to provide a satisfactory means of distinguishing the sound of *u* in *up* from that of the same letter in *full*.

Testimonial to Dr. H. Kiepert.—In recognition of his great services to geography, both ancient and modern, the friends of Dr. H. Kiepert have resolved to present to him, on his eightieth birthday, which occurs on July 31, a memorial volume containing a series of original papers bearing on ancient geography. Contributions have been offered by such well-known writers as Mommsen, Hübner, Partsch, Benndorf, Oberhummer, Kretschmer, and others; and the work will be brought out under the auspices of the publishing firm of Dietrich Reimer. The price has been fixed at 20 marks, before publication, and an early intimation of the names of intending subscribers, a list of whom will appear on the fly-leaf, is requested by the publisher.

OBITUARY OF THE YEAR.

The following is a list of Fellows of the Society who have died during the year 1897–98 (April 30):—

Sir Rutherford Alcock, K.C.B., F.R.S.; Captain Thomas Alderton; Lieut. E. G. Alston; James Anderson; Major G. W. Bartram, R.E.; James Bateman, F.R.S.;

J. Theodore Bent; James Brand; David Brandon; Right Hon. Lord Monk Bretton; John Buckley; A. F. Bundock; Lieut. F. H. S. Cator; Admiral R. Coote; Sir Langham Dale, K.C.M.G.; W. B. D'Almeida; Baron Oscar Dickson; A. M. Dunlop; George Elder; Ney Elias; Rev. E. W. Ford; Sir A. W. Franks, K.C.B.; Henry Gale; Ernest Giles; Charles Grey; Sir Brandford Griffith, K.C.M.G.; A. G. S. Hawes; G. C. Hawker; James Heawood; Boyd Horsbrugh; Lieut.-General Sir Drummond Jervois, G.C.M.G., C.B.; T. B. Johnston; Sir Polydore de Keyser; Joseph King; B. T. Knights; C. J. Leaf; F. L. Leveaux; Hon. G. A. Lloyd; Mrs. E. Maberley; Edward Mackeson; H. Mann; H. M. Matheson; Lord Monkswell; J. Carrick Moore; W. V. Murray; George Norton; Henry Nourse; E. D. Ogilvie; James Parlane; Captain Crawford Pasco; S. E. Peal; Captain Francis Peel; James Robert Phillips; S. C. Potter; John Fish Pownall; Colonel Sir Norman W. D. Pringle, Baronet; R. C. Rapier; Sir W. C. F. Robinson, G.C.M.G.; Joseph Ruston; E. E. Sabel; H. Sylvester Samuels; Hercules Scott; H. B. Simonson; J. Travers Smith; Sir Walter E. de Souza; E. W. Stanton; Colonel H. C. B. Tanner; General W. B. Thomson; Sir J. B. Thurston; Walter Turnbull; General Blois Turner; J. E. Turner; T. E. Twycross; W. R. Vines; R. B. Wade; General H. J. Warre; Major R. P. Warren; John Whitehead; Percy Whitehead; William Wickham, M.P.; Robert Wilson; The Bishop of Winchester; Major Alexander Wood.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1897–98.

Anniversary Meeting, May 23, 1898.—Sir Clements Markham, K.C.B., F.R.S., President, in the Chair.

The Secretary read the Minutes of the last Anniversary Meeting.

Elections.—*Ernest Wynne Martelli; Colonel Edmund S. Walcott, C.B.*

The Presentation of the awards for the year then took place.

The President: Dr. Sven Hedin, the Council has awarded to you the Founders' Medal of the Royal Geographical Society, for your important journey through Central Asia, during which you surveyed the glaciers of Mustagh-ata, and crossed for the first time the desert of Takla Makan, made important discoveries in the Tian-shan region, and solved the geographical problem connected with Lob-nor. We also had in our minds your previous journeys, and the remarkably excellent training as a geographer to which, from your earliest years, you have subjected yourself, and which enabled you to perform your journeys, so that they should be alike most important and useful to science, and also most honourable to yourself. I have great pleasure in presenting you with this medal.

Dr. Sven Hedin: I very highly appreciate the great distinction which to-day has been bestowed upon me, and at the same time I express my deep and warm regard for the Royal Geographical Society. I desire to say that, of the ten medals which I have received for my last journey across Asia, I regard the one which I have the honour to receive to-day from the Royal Geographical Society, as the most important and the most precious to me, as it has been conferred upon me by the most renowned and the greatest of all the Geographical Societies in the world. I am proud to find myself placed at the side of my great predecessors and teachers, Carey, Ney Elias, Holdich, Littledale, Younghusband, and Prjevalsky, and I feel the distinction to be too great in comparison with the work which I have performed;

but I allow myself to regard it as an encouragement to new researches into the interior of that great continent, where so much is still left to be done. It is a very great pleasure for me to find my name inscribed on the roll of honour of the Royal Geographical Society. The medal, which in itself is of such high value, is all the more precious to me inasmuch as I have had the honour to receive it from the hands of the illustrious President of that Society.

The PRESIDENT: Mr. Carter (Secretary of the U.S. Embassy), I am happy to be able to inform you that the Patron's medal of the R.G.S. has been assigned to Lieut. Peary. I think this Society has conferred its medal upon most of the principal American arctic explorers, beginning with Dr. Kane, who was an old friend of mine years before he started upon his exploration, and including Mr. Hayes and General Greeley; but I think Lieut. Peary stands quite apart from the distinguished men I have just mentioned. He was not so much an arctic explorer as a glacier explorer. In that, he stands quite alone, and first. His journey with the dogs over 1200 miles on the inland ice of Greenland is unequalled, and he was completely successful in achieving that which he wished to do. He settled the question of the northern limit of the great glacier of Greenland. I cannot help alluding to another piece of service done by Lieut. Peary, which is perhaps not so much geographical as ethnological, and that is his admirable treatment of that interesting tribe, the Arctic Highlanders. If it had not been for Lieut. Peary, they would have been extinguished, but he supplied them with means of obtaining their food, which they never had before. I have great pleasure in placing in your hands, for transmission to Lieut. Peary, the Patron's medal of the R.G.S.

Mr. CARTER: I am charged by the Ambassador to express his deep regret for not being able to be here present in person, and to thank the Royal Geographical Society for the great honour which has been bestowed upon his countryman.

The PRESIDENT: Mr. H. Warington Smyth, the Murchison Grant has been assigned to you by the Council of the Royal Geographical Society, for the large amount of geographical information which is contained in your three journeys in Siam, and I think we have looked more particularly to the admirable way in which these journeys have been described by you, for we consider it is one of the most valuable qualifications of a geographer that he should be able to describe the country in which he travels well and clearly. I cannot help saying, as President of this Society, that it is an extra pleasure to be able to hand this grant to you, Mr. Smyth, because we remember that your grandfather was the principal founder of this Society, and that when he was its President, by his great administrative and financial skill, he saved our Society when it was at its lowest ebb. We remember also that your father was an honoured member of our Council, and we feel confident that you will follow in their footsteps.

Mr. WARINGTON SMYTH: I have to thank you, Sir Clements—you and the Council of the R.G.S.—for doing me this honour, which I certainly never expected to attain to.

The PRESIDENT: The Back Grant has been given to Mr. George P. Tate, for his excellent work in surveying, especially in Baluchistan. I have to request that Sir Thomas Holdich will take charge of the grant, for transmission to Mr. Tate.

The PRESIDENT: Mr. Edmund T. Garwood will receive the Gill Memorial, for the work he did in physical geography whilst surveying in two expeditions in Spitsbergen with Sir Martin Conway. Mr. Sweet had undertaken to receive the Cuthbert Peek Grant for Mr. Poulett Weatherley, which has been granted to him for the work he has done in navigating Lake Bangweolo. We have felt that Mr. Weatherley also deserves recognition for his treatment of the natives, his sympathy for them, and the just way in which he has always treated them, and for the great influence he has acquired over the chiefs. He has been working quite alone in Central Africa for four years.

The President then delivered his Annual Address (see p. 1).

Sir ANTHONY HOSKINS: A very grateful task devolves upon me, and that is to propose a vote of thanks to the President of the Society for the address which he has given us, and which, I venture to think, supplies an admirable summary of the work which has been undertaken by geographical explorers and by the R.G.S. during the past year. That the Society has been so successful, as he has shown in his concluding words, is, I am sure you will all agree, largely due to his own admirable work—work which has not been confined to the financial and administrative side of the Society's requirements, but has extended over a very large area besides, both literary and social. With reference to the latter, I would allude to the reception of the foreign geographical representatives and such occasions as that of which we had an example the other night, when we celebrated the 400th anniversary of Vasco da Gama, and were indebted to our President for an address of great interest to the large audience present. I am sure, therefore, you will all cordially unite in a vote of thanks to Sir Clements Markham for his address to-day.

Sir FREDERICK YOUNG: I am quite sure that the proposal made by Sir Anthony Hoskins does not require any seconder, but I was most anxious to say a word or two with regard to the most interesting and comprehensive address with which you have just favoured us. In one of your opening sentences you referred particularly to the coming antarctic expedition. I am here as the representative of another great society—the Royal Colonial Institute—of whose Council several members are present this afternoon. The attention of our Council has been long since called to the efforts of the Royal Geographical Society in the direction of the great object of antarctic exploration, and we have already urged upon the Government to the best of our power the duty of encouraging and giving their sanction to this most admirable object. At the last annual meeting of our society, at which I had the honour to preside, reference was made to this very fact, and we told our Fellows that we are most anxious to do everything on our part to urge the Government to make all those efforts which we feel it is their duty to do with reference to this great question, in which other nations are taking the lead. It is hardly creditable to us that this should be so, and I think we should not be content to follow, but should be determined to take precedence of other nations in regard to an enterprise of this importance. I cannot sit down without thanking you very much for your address, and congratulating both you and the Society that you are restored again to health.

The PRESIDENT: In thanking the meeting for its vote, and my friends the proposer and seconder for what they have so kindly said, I can only express my regret that, through the illness which has attacked me, I have not been able to attend to your interests so well as I have done in previous years.

The visitors then withdrew, and the President having appointed Mr. Delmar Morgan and Mr. H. Leonard scrutineers, the election of the Council for the ensuing year was proceeded with.

The Hon. Secretary then read the report of the Council for the past year; this will be published in the Year-Book for 1899.

THE BALLOT FOR THE NEW COUNCIL.

The PRESIDENT then announced that the Council as proposed had been elected.

The list is as follows, the names of new members, or those who change office, being printed in *italics*:—

President:—Sir Clements R. Markham, K.C.B., F.R.S., F.S.A. *Vice-Presidents*: *Hon. George C. Brodrick*; Right Hon. Sir George D. Taubman Goldie, K.C.M.G.; *Admiral Sir F. Leopold McClintock*, K.C.B., D.C.L., F.R.S.; General Sir R. Strachey, R.E., G.C.S.I., F.R.S.; Admiral Sir W. J. L. Wharton, K.C.B., F.R.S.; General Sir Chas. W. Wilson, R.E., K.C.B., K.C.M.G. *Treasurer*: Edward L. Somers Cocks. *Trustees*: Right Hon. Sir John Lubbock, Bart., F.R.S., M.P.; Cuthbert E. Peek, F.S.A. *Honorary Secretaries*: Major Leonard Darwin, R.E.; James F. Hughes. *Foreign Secretary*: Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Members of Council*: Lord Belhaven and Stenton; W. T. Blanford, LL.D., F.R.S.; Colonel George Earl Church; *Clinton T. Dent*; Colonel William Everett, C.M.G.; Colonel J. Farquharson, C.B., R.E.; *Lieut.-Colonel Sir Thomas Hungerford Holdich*, R.E., K.C.I.E., C.B.; Admiral Sir Anthony H. Hoskins, G.C.B.; *St. George R. Littledale*; Right Hon. Lord Loch, G.C.B., G.C.M.G., etc.; Alfred P. Maudslay; General Sir H. W. Norman, G.C.B., G.C.M.G.; Surg.-Major Sir George S. Robertson, K.C.S.I.; *George S. Mackenzie*, C.B.; P. L. Sclater, F.R.S.; *Frederick Courtney Selous*; *Herbert Warington Smyth*; Lord Stanmore, G.C.M.G.; Colonel Sir Henry R. Thuillier, R.E., K.C.I.E.; Admiral the Hon. W. J. Ward; *Colonel Charles Moore Watson*, R.E., C.M.G.

THE ANNIVERSARY DINNER.

In the evening the anniversary dinner took place at the Hotel Cecil. The President, Sir Clements Markham, K.C.B., occupied the chair. There were about 220 present, including the following distinguished guests: The Minister of Sweden and Norway, the Chinese Minister, the Marquis of Lothian, the Earl of Camperdown, Lord Strathcona, General Sir William Lockhart, Sir Herbert Maxwell, General Sir Evelyn Wood, Sir Henry Dering, Admiral Sir R. Macdonald, General Sir Edwin Markham, Sir Francis Mowatt, Sir William White, Sir Frederick Abel, Sir John Evans, Sir Archibald Geikie, Sir E. Franklin, Sir Henry Longley, Sir George Chambers, Admiral Sir C. E. Domville, the Astronomer Royal, Sir Robert Ball, Rev. Dr. Welldon, Prof. Rücker, Dr. Sven Hedin, Dr. Thoroddsen.

The PRESIDENT proposed the toasts of "The Queen," "The Prince of Wales and the Duke of York," and "The Army and Navy." Admiral Sir C. E. DOMVILLE replied for the Navy, and General Sir W. LOCKHART for the Army. The PRESIDENT proposed "The Medallists," to which Dr. SVEN HEDIN replied. Sir HENRY NORMAN proposed "The Guests," which was responded to by the Chinese Minister and Dr. WELLDON. Major DARWIN proposed "The Allied Sciences," to which the Astronomer Royal and Sir ARCHIBALD GEIKIE replied. In conclusion Lord LOTHIAN proposed the toast of "The President."

Afternoon Technical Meeting, Wednesday, May 25.—SIR CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

The paper read was:—

"The Influence of Geographical Conditions on Social Development." By Prof. Patrick Geddes.

Thirteenth Ordinary Meeting, June 6, 1898.—SIR CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Herbert Sanford Claye*; *Devi Daval*; *John Davidson Milburn*; *Sir Robert Pullar, J.P., F.R.S.E.*; *Robert Lucas Tooth*; *Edward Strong Torney*; *Captain Henry Hampden Wigram* (*Scots Guards*).

The Paper read was:—

"Circumnavigation of Lake Bangweulu." By Poulett Weatherley.

Fourteenth Ordinary Meeting, June 20, 1898.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—*William Bowyer; Charles William Lloyd Bulpett; Harold Gilmore Campion; Arthur Elstob; F. R. S. Gervers (Lieut. R.E.); William Henry Hall; David William Harwood; George Duncan McGrigor; Alfred J. Paten; Coningsby C. Sibthorp, J.P.; James B. Taylor; Montagu R. Waldo-Sibthorp, J.P., D.L.; Leedham White, F.C.S.*

GENERAL WOODTHORPE.

The PRESIDENT: Before beginning the work of the evening, I cannot refrain from referring to the great loss the Society has sustained by the very unexpected death of General Woodthorpe. He had been working on the Indian frontier, amidst pestiferous jungles and snowy peaks, for upwards of thirty years. When I first remember him, he had just written that interesting narrative of the Lushai expedition, which I think was in 1872. He will be a great loss to the Society. He had only gone out to India to finish his time for a couple of years, and then we looked forward to the great advantage of having him on our Council. His services were most valuable to the State, and I believe he was one of the most popular officers in India, so that his loss will be mourned by a very large circle of friends.

The Paper read was :—

"Tirah: the Geographical Results of the recent Afridi Campaign." By Colonel Sir Thomas Hungerford Holdich, R.E., K.C.I.E., C.B.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps—Karren. *Petermanns M.* 44 (1898): 69–71. **Eckert.**

Die Karren oder Schratten. Resultate der Untersuchungen über Karrenfelder in den deutschen Alpen. Von Dr. Max Eckert.

Karren are peculiar fissures in the rocky surface of some mountainous regions, and this paper deals with the study of their form with a view to determine their origin.

Alps—Western. **Coolidge.**
W. A. B. Coolidge. Le Massif de Scolette. Lyon: Imp. Mougin-Rusand, 1898. Size 10 × 6½, pp. 30. *Map and Illustration.*

A detailed description, with annotated bibliography, of the little-known western portion of the Alpine chain between the Fréjus tunnel (usually called the Mont Cenis tunnel) and Mont Cenis, the eastern part of which was described last year by the same author.

Austria. ———
Publicationen für die Internationale Erdmessung. Die Astronomisch-Geodätischen Arbeiten des K. und K. Militär-Geographischen Institutes in Wien. X. Band. Das Präcisions-Nivellement in der Oesterreichisch-Ungarischen Monarchie. III. Nordöstlicher Theil. Herausgegeben vom K. und K. Militär-Geographischen Institute. Wien, 1897. Size 12 × 9½, pp. viii. and 202. *Map. Presented by the Institute.*

Austria—Dalmatia. *M.G. Ges. Wien* **40** (1897): 811–827. **Kerner.**
Das mittlere Kerkathal. Von Dr. Fritz v. Kerner. *With Plates.*

The six photographs accompanying this paper are views of the waterfalls on the Kerka.

Austria—Geographical activity. *M.G. Ges. Wien* **40** (1897): 832–853. ———
Bericht über die Leistungen der österreichischen Staatsinstitute und Vereine auf dem Gebiete der geographischen und verwandten Wissenschaften im Jahre 1896.

A summary of the work done during 1896 by the Austro-Hungarian Military Geographical Institute, Geological Institute, Statistical Department of the Ministry of Commerce, Central Statistical Commission, Institute for Meteorology and Terrestrial Magnetism, and the Scientific Exploration of Bohemia. It would have added completeness to the article if the universities and larger geographical associations had also been dealt with.

Austria—Language. *G.Z.* **4** (1898): 241–265. **Zemmrich.**
Deutsches und tschechisches Sprachgebiet. Von Dr. J. Zemmrich. *With Map.*

On the distribution of language in Bohemia and Moravia, showing the area of Chech speech, with the fringing area of German, and the various outlying islands of either language. The areas of mixed speech are curiously small.

Austria—Tyrol. *Appalachia* **8** (1898): 337–350. **Balch.**
Reminiscences of Tyrol. By Edwin Swift Balch. *With Illustrations.*

Austria—Vienna. **Penck.**
Vorträge des Vereines zur Verbreitung naturwissenschaftlicher Kenntnisse in Wien. XXXV. Jahrgang—Heft 18. Die geographische Lage von Wien. Vortrag, gehalten den 28 November 1894. Von Albrecht Penck. Wien, 1895. Size 7½ × 5, pp. 34. *Presented by the Author.*

On the geographical position of Vienna, and the causes of the growth of that city.

Austria—Vienna. **Zannoni.**
Austria-Ungheria. La Colonia Italiana in Vienna. Rapporto del cav. Giacomo Zannoni.—Bollettino del Ministero degli Affari Esteri. Aprile, 1898. Roma, Libreria Bocca. Size 9½ × 6½, pp. 14.

Balkan Peninsula. *Scottish G. Mag.* **14** (1898): 225–241. **Callan.**
Lands and Peoples of the Balkans. By the Rev. Hugh Callan, M.A.

Eastern Mediterranean Lands. *Ann. G.* **7** (1898): 112–141. **Philippson.**
La tectonique de l'Égéide. Par M. A. Philippson. *With Map.*

Prof. Phillipson summarizes his extensive researches on the physical geography and geology of the Greek peninsula and Asia Minor, and shows in a clear map the main structural lines which determine the composite surface forms of the region.

France—Ardèche. *B.S.G. Lyon* **14** (1898): 751–765. **Bourdin.**
L'Ardèche. Par M. Louis Bourdin.

France—Dauphiné. **Martel.**
Les Abimes du Dauphiné. [Par E. A. Martel.] Size 9½ × 6, pp. 60. *Plans.*

France—Dunes. *B.S.G. Com. Bordeaux* **21** (1898): 159–173. **Duffart.**
Distribution géographique des dunes continentales de Gascogne. Par Charles Duffart. *With Map and Section.*

The map distinguishes the modern dunes dating no farther back than the fourteenth century, the ancient littoral dunes of historic time, and the ancient continental dunes of prehistoric times.

France—Lakes. *Petermanns M.* **44** (1898): 86–90. **Halbfass.**
Die Seen Frankreichs. Von W. Halbfass.

A review of Delabecque's work.

France—Population. *Ann. G.* **7** (1898): 172–177. **Milhaud.**
La densité de la population française en 1801, 1846, 1896. Par M. A. Milhaud. *With Maps.*

The density of population is shown on the maps by shading, the department being the unit.

France—Rhone. *Rev. Scientifique* **9** (1898): 487–491, 516–523, 554–559. **Souleyre.**
L'aménagement industriel du Rhône. Par M. A. Souleyre.

A plea for the more complete utilisation for the river Rhone by improving it for navigation, for irrigation, and for the production of power.

France—Time-Standard. *Rev. Scientifique* **9** (1898): 579–581. **Bouquet de la Grye.**
L'heure nationale. Par M. Bouquet de la Grye.

An appeal for the old order of things, and against the introduction of Western European time in France.

Germany—Bavaria. *Sitz. A. W. München* (1898): 3–18. **Gümbel.**
Ueber die in den letzten Jahren in Bayern wahrgenommenen Erdbeben. Von C. W. v. Gümbel.

A list of the authentic earthquakes recorded in Bavaria from 1117 to 1897. The years in which earthquakes were recorded were 1117, 1348, 1690, 1822, 1865, 1868, 1870, 1886, 1888, and every year since except 1892.

Germany—Bavaria. **Muntz.**
Tour du Monde **3** (1897): 313, 325, 337; **4** (1898): 217, 229.
En Allemagne. Voyages aux Villes historiques de la Franconie. Par M. Eugène Müntz. *With Illustrations.*

Germany—Heligoland. **Servières.**
A travers le Monde, Tour du Monde **4** (1898): 105–108.
Notes sur Helgoland. Par Georges Servières. *With Illustrations.*

Germany—Hunsrück. **Meyer.**
Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Elfter Band, Heft 3. Zur Kenntnis des Hunsrücks. Von Dr. Fritz Meyer. Stuttgart: J. Engelhorn, 1898. Size 9½ × 6½, pp. [34]. *Map.*

A systematic study of the upland region of the Hunsrück, with an orographical contoured map on the scale of 1 : 240,000, the effect of which is not improved by the isolation of the region from its surroundings, nor by the manner of colouring.

Holland. *Travel* **3** (1898): 11–17. **Crowther.**
Holland, the Country below the Sea. By Henry Crowther. *With Illustrations.*

Iceland. *Globus* **73** (1898): 292–294. **Gebhardt.**
Statistisches aus Island. Von Dr. phil. August Gebhardt.

Comparative statistics of Iceland, showing how the population sank from nearly 105,000 in 1096 to about 47,000 in 1801, and has since risen gradually to nearly 71,000 in 1890; and dealing also historically with longevity, natural resources, and trade.

Italy. *Rendiconti R.A. Lincei* **7** (1898): 103–126. **Ashby.**
Sul vero sito del lago Regillo. Nota del sig. Tommaso Ashby. *With Map and Illustrations.*

A summary of the controversies as to the situation of Lake Regillus, with an opinion as to its true site being a dry lake-basin a short distance north of Frascati.

Portugal—Lisbon. *Ann. Hydrographie* **26** (1898): 1–36. ———
Segelanweisung für den Hafen von Lissabon, nach der neuesten amtlichen Veröffentlichung der portugiesischen Admiralität.

Sailing directions for Lisbon harbour.

Pyrenees. *Ann. G.* **7** (1898): 166–172. **Dognon.**
Sur l'orientation de la chaîne des Pyrénées d'après Strabon. Par M. P. Dognon. *With Diagram.*

Illustrating Strabo's view of the Pyrenees as a range running north and south.

Rockall. *T.R. Irish A.* 31 (1897): 39–98. ———

Notes on Rockall Island and Bank, with an Account of the Petrology of Rockall, and of its Winds, Currents, etc.: with Reports on the Ornithology, the Invertebrate Fauna of the Bank, and on its Previous History. *With Plates.*

An abstract of this paper appeared in the *Journal* for January (vol. xi. p. 48).

Russia. *M.G. Ges. Wien* 41 (1898): 273–285. **Diener.**

Bericht über die Excursionen des VII. internationalen Geologen-Congresses in den Ural, den Kaukasus und die Krim. Von Dr. C. Diener.

Russia. **Trevor-Battye.**

A Northern Highway of the Tsar. By Aubyn Trevor-Battye. London: A. Constable & Co., 1898. Size 8 × 5½, pp. xiv. and 256. *Portrait, Map, and Illustrations. Price 6s. Presented by the Publishers.*

This gracefully written book is a sequel to the author's larger work, 'Ice-bound on Kolguev,' and describes his return journey from Kolguev at the season of the year between autumn and winter, when all traffic, even the postal service, is usually suspended on the Tundra. The route pursued was up the Pechora to Ust Tsilma, and thence across country westwards to Archangel, and then south to Vologda.

Russia—Finland. *M.G. Ges. Wien* 41 (1898): 219–261. **Dierkes.**

Land und Leute in Finnland. Von Leopoldine von Morawetz Dierkes.

Russia—Historical. *G.Z.* 4 (1898): 268–274. **Ratzel.**

Politisch-geographische Rückblicke. III. Das russische Reich. Von Prof. Dr. Friedrich Ratzel.

A sketch of the historical development and present area of the Russian empire, viewed from the standpoint of political geography.

Russia—Lapland. *Rev. Maritime* 136 (1898): 359–364. **Grévin.**

La côte Mourmane; traduit de l'allemand. Par G. Grévin.

Russia—Novaya Zemlya. *Iz. Imp. Russian G.S.* 33 (1897): 360–366. **Bukhteyeff.**

Hydrographical researches of the transport *Samoyed* on Novaya Zemlya. By A. Bukhteyeff. [In Russian.] *With Maps.*

On hydrographic observations made on the coast of Novaya Zemlya in 1896; the maps show soundings in Byelushya bay, and a comparison of the coast-line of the bay as determined in 1896 with the rough sketch made in 1839.

Russia—Novorossisk. *B.S.G. Marseille* 21 (1897): 374–380. **Scheult.**

Le port de Novorossisk. Par le commandant E. Scheult.

A detailed description of the town and port of Novorossisk on the Black Sea.

Russia—Odessa. *B.S.G. Marseille* 21 (1897): 123–142. **Bourge.**

Odessa. Par M. G. Bourge.

Russia—Odessa. *B.S.G. Marseille* 21 (1897): 143–149. **Saint-Yves and Zablondowski.**

Le développement économique d'Odessa. Par MM. G. Saint-Yves et L. Zablondowski.

Russia—Olonetz. *Iz. Imp. Russian G.S.* 32 (1897): 440–441. **Lentsi.**

Magnetic anomalies in the Northern part of Podenetz district, Gov. Olonetz. By Lentsi. *Map.* [In Russian.]

Russia—People. *Fortnightly Rev.* 63 (1898): 147–159. **Dillon.**

The Struggle of Religions and Races in Russia. By Dr. E. J. Dillon.

An analysis of the statistics of populations and religions in Russia.

Russia—Population. ———

Premier Recensement Général de la Population de l'Empire de Russie, 1897. Publication du Comité Central de Statistique au Ministère de l'Intérieur. Livraison 1. Population de l'Empire recensée le 28 Janvier—9 Février 1897; par districts. D'après les Calculations locales. (St. Pétersbourg, 1898); Livraison 2. Population des Villes. [In Russian.] St. Pétersbourg, 1897. Size 9 × 7½. *Presented by the Comité Central de Statistique, St. Petersburg.*

The tables are printed with headings in Russian and French.

Russia—Southern Lakes. **Sokolow.**

Verh. Russ.-K. Mineralog. Ges. St. Petersburg 35 (1897): 1–18.

Beiträge zur Kenntniss der Limane Südrusslands. Von Dr. N. Sokolow.

Russia—Ural. *Iz. Imp. Russian G.S.* **33** (1897): 366–368. **Abels.**

The altitudes of Alexandrovskay Sopka and Taganai, S. Ural Mountains, in the vicinity of the city Slatoust. By G. Abels. [In Russian.]

Russia—Volga. *Travel* **2** (1898): 445–449. **Page.**

Up the Volga. By John Ll. Warden Page. *With Illustrations.*

Russia—Volhynia. *Annuaire Géolog. et Minéralog. Russie* **2** (1897): 51–63. **Tutkowski.**

Zur Geologie des Lutzk'schen Kreises im Gouv. Wolhynien. 2. Ueber den See-Löss und den subaëralen Löss. Vorläufiger Bericht von P. Tutkowski.

Spain. *B.S.G. Madrid* **39** (1897): 196–202. **Jiménez.**

Estudio estratégico de la Peninsula Ibérica, desde el punto de vista del ingeniero, por el Coronel del Cuerpo D. Francisco Roldán y Vizcaino. Por D. Eusebio Jiménez.

Analysis of a work on the strategical geography of the Iberian peninsula, by Colonel Roldan y Vizcaino.

Spain. *Globus* **73** (1898): 174–177. **Karutz.**

Guetaria im Baskenlande. Eine Erinnerung an den ersten Weltumsegler. Von Dr. Karutz.

On a visit to the birth-place of Del Cano, with references to his first circumnavigation of the globe.

Spain—Andalusia. *Contemporary Rev.* **73** (1898): 714–726. **Pennell.**

In Andalusia with a Bicycle. By Joseph Pennell.

A tour from Gibraltar through Tarifa and Seville to Granada, which was taken as a centre for short tours; then to Malaga, along the coast to Motril, and back to Granada by mountain roads.

Spain and Portugal. **Baedeker.**

Spain and Portugal. Handbook for Travellers, by Karl Baedeker. With 6 Maps and 46 Plans. Leipsic, Karl Baedeker; London: Dulau & Co. 1898. Size 6¾ × 4½, pp. lxxxvi. and 618. *Price* 16*s.* *Presented by Messrs. Dulau & Co.*

This new guide will be welcome to tourists. It conforms in all respects to the well-known model of Baedeker's handbooks. It includes a historical sketch of Spanish art by Prof. C. Justi, the usual introductory matter, and sixty-six routes, covering the whole Iberian peninsula. The maps and plans are clear and numerous; that of the peninsula shows a number of interesting features not often dealt with in maps of the kind.

Spain—Cuenca. *B.S.G. Madrid* **39** (1897): 145–166. **Maria and Coello**

Caminos romanos de la provincia de Cuenca. Informes presentados á la Real Academia de la Historia. Por D. J. Santa Maria y D. Francisco Coello.

Spain—Historical. *Mém. Couronnés A.R. Belgique* **54** (1896): i.–xiv. and 1–52. **Gossart.**

Charles-Quint et Philippe II. Étude sur les origines de la prépondérance politique de l'Espagne en Europe. Par Ernest Gossart.

Spain—Majorca. **Martel.**

Sous terre (neuvième campagne, 1896) Cueva del Drach, á Majorque.—Scialets du Vercors. Chouruns du Dévoluy. Par M. E.-A. Martel. From 'Annuaire du Club Alpin Français,' 23^e volume. 1896. Size 9 × 6, pp. 46. *Illustrations. Presented by the Author.*

The greater part of this paper is occupied with the description of the Cueva del Drach, in Majorca.

Sweden. *Deutsche Rundschau G.* **20** (1898): 198–205. **Hansen.**

Aus dem südlichen Schweden. Von Felix Hansen.

A tourist's impressions of Southern Sweden.

Sweden—Gothland. *K. Svensk. Vet.-A. Handlingar* **29** (1897): No. 1. **Johansson.**

Hufvuddragen af Gotlands växttopografi och växtgeografi grundade på en Kritisk behandling af dess Kärlväxtflora. Af K. Johansson. *With Map.* Pp. 1–270.

This article is accompanied by a floral map of Gothland on the scale of 1 : 300,000.

Sweden—Jemtland. *B. Geolog. I. University of Upsala* **3** (1896): 269–304. **Wiman.**

Kambrisch-silurische Faciesbildungen in Jemtland. Von Carl Wiman. *With Map and Plates.*

On the land-forms associated with the Cambrian and Silurian formation in Jemtland.

ASIA.

China. *Rev. Française* 23 (1898): 221–225, 277–283. **Montell.**
Le premier partage de la Chine. Par A. Montell. *With Sketch-Map.*

On the spheres of European influence in China.

China. *B.S.G. Com. Paris* 20 (1898): 10–27. **Brenier.**
Les voyages et les résultats de la mission lyonnaise d'exploration commerciale en Chine. Par M. Henri Brenier. *With Map.*

China. *B.S.G. Lyon* 14 (1898): 693–709. **Brenier.**
La situation commerciale des principales puissances en Chine, mission lyonnaise. Par Henri Brenier.

China. *Questions Dipl. et Colon.* 4 (1898): 6–12. **Madrolle.**
Questions Chinoises: Kouang-Tcheou, Sancian, Hai-Nan. Par Claudius Madrolle. *With Maps.*

China. *Ann. G.* 7 (1898): 177–180, 270–272. **Madrolle.**
La péninsule de Loui-Tcheou. Par M. Cl. Madrolle.

China. *J. R. United Service I.* 42 (1898): 406–437. **Colquhoun.**
The Chinese Question: how it may affect our Imperial Interests. By Archibald Colquhoun. *With Map.*

China—Port Arthur. *Questions Dipl. et Colon* 4 (1898): 98–102. ——
Une visite à Port-Arthur, après la conquête japonaise. Par Un Marin. *With Maps.*

Plan and views of Port Arthur and its batteries.

China—Shantung. *Naturw. Wochenschrift* 13 (1898): 141–145. **Richthofen.**
Der geologische Bau von Schantung (Kiau-tschou) mit besonderer Berücksichtigung der nutzbaren Lagerstätten Nach der Mittheilung des Geheimrath Prof. Dr. Ferdinand Frhr. v. Richthofen in der Zeitschrift für praktische Geologie (Berlin). *With Maps.*

China—Shantung. *Rev. Française* 23 (1898): 263–276. **Fauvel.**
La Province du Chantoung. Par A. A. Fauvel. *With Map.*

China—Sze-chwan. *B.S.G. Marseille* 21 (1897): 351–361. **Grosjean.**
Les Salines de Tze-Lieou-Tsin. Par M. A. Grosjean.

A description of the great field of brine-wells, which has accumulated a population of a million people in the town of Tze-liu-tsin.

China—Trade. *Petermanns M.* 44 (1898): 81–86. **Supan.**
Chinas Aussenhandel in Jahre 1896. Von A. Supan.

China—Turkestan, etc. **Roborovski.**
V. I. Roborovsky. The Expedition to Central Asia, 1893–1895. [In Russian.] Size 9½ × 6½, pp. 60. *Presented by the Author.*

China—Wei-hai-Wei. **Lagnérie.**
A travers le Monde, Tour du Monde 4 (1898): 113–116, 129–132.
Les Positions navales de la Mer Jaune, Taï-Lien-Wan et Port-Arthur, Weï-Haï-Weï. Par M. Villetard de Laguérie. *With Map and Illustrations.*

China—Yunnan. *Kew B.* (1897): 407–414. **Henry.**
A Budget from Yunnan. [By Dr. Henry.]

Letters from Yunnan "addressed to Kew," and giving a number of notes of places and people, as well as of the botany of the Chinese frontier.

Dutch East Indies. *B.S. d'Études colon.* 5 (1898): 25–78. **Plas.**
La Colonisation hollandaise aux Indes orientales. Par J. Plas. *With Illustrations.*

Eastern Asia. **Széchenyi.**
Wissenschaftliche Ergebnisse der Reise des Grafen Béla Széchenyi in Ostasien, 1877–1880. Zweiter Band. Die Bearbeitung des gesammelten Materials. Wien: E. Hölzel, 1898. Size 11½ × 9, pp. xiv. and 784. *Plates. Presented by the Author.*

This great volume, a translation of the Hungarian original published in 1896, contains an instalment of the discussion of the collections made by Count Béla Széchenyi in Eastern Asia. The memoirs treat of Tamil studies (linguistic), by Prof. Gabriel Bálint de Szentkatolna; the Nestorian monument in Singan-fu, by Father J. E. Heller, S.J., with two plates; and an account of the zoological and botanical collections by various specialists.

India. *J.S. Arts* **46** (1898): 569–583. **Sassoon.**
India and her Currency. By Sir Edward Sassoon, Bart.

India. *J.S. Arts* **46** (1898): 529–548. **Bell.**
Recent Railway Policy in India. By Horace Bell.

India—Assam. *J.S. Arts* **46** (1898): 473–495. **Luttman-Johnson.**
The Earthquake in Assam. By H. Luttman-Johnson.

On the Earthquake in 1897.

India—Burma. *China's Millions* **6** (1898): 28–29, 35–36, 50–51, 63–64 **Steven.**
The Kachins of the Chinese Borderland. By F. A. Steven. *With Illustrations.*

India—Ceylon. *P.I. Civil Engineers* **131** (1898): 272–288. **Waring.**
The Haputale and Bandarawela Extensions of the Ceylon Government Railway, with Notes upon other Railways recently constructed in the Colony. By F. J. Waring. *With* 11 *Cuts.*

India—Punjab. *J. Franklin I.* **145** (1898): 355–360. **Lyman.**
Some Illustrations of the Influence of Geological Structure on Topography. By Benjamin Smith Lyman. *With Maps.*

The examples cited belong to the very remarkable configuration of part of the Punjab Salt Range and the country north of it, which show the relation of geological structure to geographical form.

Japan. ———
Japan and the Japan Mission of the Church Missionary Society. Third Edition. London: Church Missionary Society, 1898. Size 7½ × 5½, pp. viii. and 220. *Map and Illustrations. Price 2s. Presented by the Church Missionary Society.*

An excellent little history of missionary work in Japan, prefaced by a clear and concise account of the country, the people, and their native religions.

Mainly historical; one of the publications of the Portuguese Committee for celebrating the fourth Vasco da Gama centenary.

Japan. *Imp. and Asiatic Quarterly Rev.* **5** (1898): 309–320. **Morris.**
Japan—a Forecast. By J. Morris.

A discussion as to the direction which the future expansion of Japan is likely to follow.

Korea. **Villetard de Laguèrie.**
Villetard de Laguérie. La Corée, Indépendante, Russe, ou Japonaise. Paris: Hachette et Cie., 1898. Size 7½ × 5, pp. viii. and 304. *Illustrations.*

The author was the special correspondent of the *Temps* during the Chino-Japanese war, and had opportunities for the personal study of Korea and its political affairs.

Malay Archipelago—Borneo. **Barth.**
Tijds. Ind. Taal- Land- en Volkenk. **39** (1897): 581–646.
De landschappen aan de Boven-Pinoh (Wester-afdeeling van Borneo). Door J. P. J. Barth.

Diary of a journey in the west of Borneo in 1894.

Malay Archipelago—Java. **Komoan.**
Tijds. Ind. Taal- Land- en Volkenk. **39** (1897): 516–519.
De vogelnestgrot " Ròngkòb " in Djokjakarta. Door Komoan. *With Plate.*

Description of the Rongkob cave containing edible birds' nests in Jokjokarta.

Malay Archipelago—Philippine Islands. **Ericsson.**
Contemporary Rev. **73** (1898): 829–837.
A Visit to the Philippines. By Claes Ericsson.

The visit took place in 1894.

Malay Archipelago—Sumatra. *Verh. Ges. Erdk. Berlin* **25** (1898): 177–189. **Maass.**
Herr Alfred Maass: Ueber seine Reise nach den Mentawei-Inseln.

Malay Archipelago—Sumatra. *B.S.G. Italiana* **11** (1898): 256–299. **Modigliani.**
Materiale per lo studio dell' isola Sipòra (Mentawèi). Nota del dott. E. Modigliani. *With Illustrations.*

Malay Archipelago—Sumatra. *Naturwiss. Wochenschrift* **13** (1898): 225–229. **Fürst.**
Die Bataker. Von Dr. E. Fürst.

On the Batak people and their customs.

Malay Peninsula. **Boulenger and Wray.**
Perak Museum Notes. Vol. ii., part i. On the occurrence of Schlegel's Gavial (*Tomistoma schlegeli*) in the Malay Peninsular [*sic*]. By G. A. Boulenger, F.R.S. Together with papers on the Cave-Dwellers of Perak—Tin-Mining in Perak, Chapter iv.—Teeth blacking amongst the Malays—Gutta Cultivation—Exposed Foundations at Perak Museum—The "Rice Sapper" Beetle Pest on Gapis Estate—Report on Perak Museum. By L. Wray, jun. Taiping, 1897. Size 10 × 6¾, pp. 80. *Presented by the Perak Museum.*

Malay Peninsula—Selangor. **Rodger.**
Annual Report of the State of Selangor for the Year 1896. By J. P. Rodger. Kuala Lumpur, 1897. Size 13½ × 8½, pp. 42.

Persia. **Sykes.**
Through Persia on a Side-Saddle. By Ella C. Sykes. London: A. D. Innes & Co., 1898. Size 9½ × 6, pp. 362. *Portrait, Map, and Illustrations. Price* 16*s.* *Presented by the Author.*

A separate notice will be given of this book.

Russia—Altai Mountains. *Iz. Imp. Russian G.S.* **33** (1897): 356–360. **Sapozhnikoff.**
Glaciers of the Altai Mountains. By V. V. Sapozhnikoff. [In Russian.]

Russia—Caucasus. *Mém. Caucasian Sect. Imp. Russian G.S.* **19** (1897): 161–168. ———
Historical Sketch of the Cossack army and the cities of the Province Terskaya, N. Caucasus. [In Russian.]

Russia—Caucasus. *Rev. G.* **42** (1898): 180–198, 241–265, 321–344. **Baye.**
En Géorgie. Par Baron de Baye. *With Illustrations.*

Russia—Caucasus. *Globus* **73** (1898): 281–288. **Greim.**
Ein Ausflug zum Zei-Gletscher in der Centralkette des Kaukasus. Von Dr. G. Greim. *With Illustrations.*

Russia—Caucasus. *Mém. Caucasian Sect. Imp. Russian G.S.* **19** (1897): 115–160. ———
Statistics of Terskaya Province, N. Caucasus, 1894. [In Russian.]

Russia—Siberia. **Simpson.**
Side Lights on Siberia. Some Account of the Great Siberian Railroad, the Prisons, and Exile System. By James Young Simpson. Edinburgh and London: W. Blackwood & Sons, 1898. Size 8¾ × 6, pp. xvi. and 384. *Map and Illustrations. Price* 16*s.* *Presented by the Publishers.*

A valuable record of a recent journey across Siberia. A sketch of the land and the people is followed by an account of the Great Siberian railway, and a narrative of travel on the old post-road to Irkutsk. Then a connected description of the exile system is given, with impressions of the prisons and penal conditions considered in an impartial manner. Special details are given of Alexandrovski Central, and the silver mines of Nerchinsk. A chapter is devoted to Sakhalin, which, however, the author did not visit. In conclusion, there are opinions on the future of Siberia, the prosperity of which is held to depend entirely on the new railway.

AFRICA.

Abyssinia. ———
Treaty Series. No. 2. 1898. Treaty between Great Britain and Ethiopia. Signed by the Emperor Menelek II., and by Her Majesty's Envoy, at Adis Abbaba, May 14, 1897. Ratified by the Queen, July 28, 1897. London: Eyre & Spottiswoode. Size 10 × 6½, pp. 10. *Price* 1*d.*

British Central Africa. **Sharpe.**
Africa. No. 5 (1897). Report by Consul and Acting Commissioner Sharpe on the Trade and General Condition of the British Central Africa Protectorate, from April 1, 1896, to March 31, 1897. London: Eyre & Spottiswoode, 1897. Size 13½ × 8½, pp. 14. *Price* 2*d.*

British South Africa. ———
The British South Africa Company. Report on the Company's proceedings and the condition of the Territories within the sphere of its operations, 1896–1897. Printed for the information of Shareholders at the 5th General Meeting, April, 1898. Size 10½ × 8½, pp. 172. *Maps and Plans.*

Report of the present position of the British South Africa Company's territory, with maps showing the railway and telegraph lines, and plans of Bulawayo, Salisbury, and other townships.

British South Africa—Mashonaland. **Alderson.**

With the Mounted Infantry and the Mashonaland Field Force, 1896. By Brevet-Lieut.-Colonel E. A. H. Alderson. London: Methuen & Co., 1898. Size 9½ × 6, pp. xvi. and 308. *Maps and Illustrations. Price* 10*s*. 6*d*. *Presented by the Publishers.*

Colonel Alderson gives a clear and spirited account of the expedition of regular troops to the relief of Salisbury, including the crossing of Portuguese territory from Beira, and the whole series of operations against the revolted Mashonas. By means of numerous diagrams and a remarkable power of untechnical description, he makes the reader see exactly what problem was suggested to the commanding officer at each point, and how each difficulty was overcome. The description of the geographical conditions from a military point of view is valuable.

German East Africa—Uhehe *Deutsche Kolonialzeitung* **11** (1898): 97–99. **Arning.**

Die Zukunft von Uhehe. Von Wilhelm Arning. *With Maps.*

German West Africa—Togo. *Deutsches Kolonialblatt* **9** (1898): 204–208. **Vietor.**

Togo: Schilderung einer Reise nach Atakpame.

Notes of the journey of a German trader from Little Popo to Atakpame in 1897. The author points out that the trade of the district takes the more direct route to the nearer seaport of Great Popo, in Dahomey.

Lake Tanganyika. *P.R.S.* **62** (1898): 451–458. **Moore.**

On the Zoological Evidence for the Connection of Lake Tanganyika with the Sea. By J. E. S. Moore.

This will be specially noticed.

Marocco. *Questions Diplomat. et Colon.* **2** (1897): 543-546. **Attanoux.**

Au Maroc. Les pirates du Riff. Par M. J. Bernard d'Attanoux.

On the Riff pirates and their country.

Marocco. *Questions Diplomat. et Colon.* **1** (1897): 472–476. **Couronnel.**

Notes sur le Maroc. Par M. le Comte de Couronnel.

An examination of the constitution of the empire of Marocco, and the real position and power of the emperor.

Marocco. *Questions Diplomat. et Colon.* **1** (1897): 321-334. **Mandeville.**

La frontière marocaine et Figuig. Par M. Mandeville. *With Illustration.*

With a view of the town of Figuig.

Marocco. *Questions Dip'omat. et Colon.* **1** (1897): 220–224. **Mandeville.**

Les troubles à la frontière marocaine. Par M. Mandeville. *With Map and Plans.*

The map is of the Algeria-Marocco frontier, and the plans of the fortified town of Ujda.

Marocco—Agurai. *Blackwood's Mag.* **163** (1898): 488–497. **Harris.**

The Town of the Renegades: Agurai. By Walter B. Harris.

Describes the first visit of a European to the little-known town of Agurai, in the neighbourhood of Mequinez.

Marocco—Fez. *Globus* **73** (1898): 233–238, 259–263. **Pfeil.**

Eine Reise nach Fez. Von Joachim, Graf v. Pfeil. *With Portraits.*

An interesting narrative of the recent visit paid by Count and Countess Pfeil to Fez.

North Africa. **Bernard.**

Augustin Bernard. Hautes-Plaines et Steppes de la Berbérie. Extrait du Bulletin de la Société de Géographie d'Oran. Oran: Imp. Fouque, 1898. Size 9½ × 6½, pp. 16. *Presented by the Author.*

An investigation into the character of the high plains and steppes of Northern Africa, with the object of introducing clearer definitions of the terms, and a distinction between surface features due to relief and those produced by climate or vegetation.

West Africa. **Harford-Battersby.**

Niger and Yoruba Notes. A Record of Work in Western Equatorial Africa. Edited by C. F. Harford-Battersby, M.D. Vol. iii. London: Marshall Brothers, 1897. Size 10 × 7½, pp. iv. and 96. *Portrait. Presented by Dr. Harford-Battersby.*

This missionary magazine contains many practical notes on some parts of West Africa which are little visited, especially in the Niger delta and its Hinterland.

West Africa—Borgu. *B.S.G. Lyon* **14** (1898): 725–729. **Ned-Noll.**
La Mission du capitaine Vermeersch au Borgou. Par Ned-Noll.

West Africa—Fernando Po. *B.S.G. Madrid* **1** (1897): 139–143. ———
Guinea española. Colonizacion en Fernando Póo.

West Africa—Lower Senegal. *C. Rd.* **126** (1898): 666–669. **Meunier.**
Contribution à la géologie du bas Sénégal. Note de M. Stanislas Meunier.

Recent exploitation of the phosphate deposits of the lower Senegal have revealed many new facts as to the geological structure of the country about the mouth of the Senegal.

West Africa—Niger. *B.S.G. Lyon* **14** (1898): 710–725. **Voulet and Chanoine.**
Dans la boucle du Niger. Par MM. le Capitaine Voulet et le Lieutenant Chanoine. *With Map.*

West Africa—Niger. *Fortnightly Rev.* **63** (1898): 576–591. **Edwards.**
The French on the Niger. The "Open Door" in West Africa. By F. A. Edwards. *With Map.*

The note on the Royal Geographical Society's system of geographical orthography attached to this careful article is not quite correct. *Timbuktu*, in accordance with that system, = *Teembooktoo*, and *Kenedugu* = *Kay-nay-doogoo.* The pronunciation *Kenny-doogoo* would require to be spelled *Kennedugu.*

West Africa—Niger. **Hourst.**
Sur le Niger et au Pays des Touaregs. La Mission Hourst par le Lieutenant de vaisseau Hourst. Paris: E. Plon, Nourrit et C^ie^, 1898. Size 9 × 6, pp. xii. and 482. *Portrait, Map, and Illustrations.*

This will be noticed along with other books on Africa.

West Africa—Niger Bend. *Questions Diplomat. et Colon.* **1** (1897): 457–462. **Vuillot.**
Du Dahomey au Niger. L'occupation de Boussa. Par M. Paul Vuillot. *With Map.*

West Africa—Niger Sources. **Trotter.**
The Niger Sources and the Borders of the New Sierra Leone Protectorate. By Lieut.-Colonel J. K. Trotter. London: Methuen & Co., 1898. Size 8 × 5½, pp. 238. *Map and Illustrations. Price 5s. Presented by the Publishers.*

This will be referred to along with other books on Africa.

West Africa—Senegal. *B.S.G. Lyon* **14** (1898): 730–750. **Mille.**
La vie commerciale et politique au Sénégal. Par M. Pierre Mille.

West Africa—Togo-Dahomey. *B.S.G. Lyon* **14** (1897): 644–647. ———
La convention de Togo-Dahomey. *With Map.*

West Central Africa. **Edwards.**
From the Kongo to the Niger. By F. A. Edwards. From the *Gentleman's Magazine*, March, 1898, pp. 299–307. *Map.* London: Chatto & Windus. Size 9 × 6. *Presented by the Author.*

A popular account of Maistre's well-known journey.

Western Sahara. *B.S.G. Madrid* **1** (1897): 137–139. ———
Sáhara español. La factoria de Rio de Oro.

NORTH AMERICA.

Alaska. **Rodman.**
Compilation of the most recent information relative to the harbors, anchorages, and dangers to navigation in the vicinity of Chatham and Peril Straits and Cook's Inlet, Alaska. Arranged and Compiled by Lieut. Hugh Rodman.—Report of the Superintendent of the U.S. Coast and Geodetic Survey, showing the progress of the work during the Fiscal Year ending with June, 1896. Pp. 373–393. Washington, 1897. Size 12 × 9½.

These notes give the result of surveys made in 1895; they are preliminary in their character to a complete survey of the coasts, which is now much wanted in order to provide trustworthy charts.

Alaska. *National G. Mag.* **9** (1898): 178–187. **Evans.**
Some of the Conditions and Possibilities of Agriculture in Alaska. By Dr. Walter H. Evans.

A careful consideration of the soils, the natural vegetation, and the experiments in raising crops and vegetables in the settled parts of Alaska leads to the conclusion that

that territory is by no means so devoid of agricultural possibilities as has usually been supposed.

Alaska. *National G. Mag.* **9** (1898): 139–172. **Emmons.**

Alaska and its Mineral Resources. By Samuel Franklin Emmons. *With Illustrations.*

An abstract of a paper prepared for the U.S. Geological Survey for the use of travellers and prospectors. It gives an excellent summary of the geographical conditions of the vast territory.

Alaska. *National G. Mag.* **9** (1898): 172–178. **Perkins.**

The Civil Government of Alaska. By Hon. George C. Perkins.

The method of administration of the United States Territory of Alaska in force pending the passing of a bill now before Congress is here described.

Alaska. *B. American G.S.* **30** (1898): 127–134. **Hayes.**

Copper River as a route to the Yukon Basin. By C. Willard Hayes. *With Maps.*

Alaska. *B.S.R.G. d'Anvers* **22** (1898): 13–34. **Richet.**

L'Alaska. Conférence donnée le 25 mars 1898. Par M. Étienne Richet. *With Map.*

Alaska—Climate. *National G. Mag.* **9** (1898): 132–137. **Greely.**

Climatic Conditions of Alaska. By General A. W. Greely.

General Greely recalls the time when the public protested against the waste of public money in attempting to acquire any knowledge of the climatic conditions of so useless a region as Alaska, and proceeds to try to satisfy the present imperative demand of the public for trustworthy information on this point by recording such scanty observations as are available.

United States—Mississippi River. *National G. Mag.* **8** (1897): 351–354. **Corthell.**

The Delta of the Mississippi river. By E. L. Corthell, D.SC., etc.

A paper read to Section E of the British Association at Toronto in 1897.

United States—Mississippi Valley. *J. Geology* **5** (1897): 795–802. **Chamberlin.**

Supplementary Hypothesis respecting the Origin of the Loess of the Mississippi Valley. By T. C. Chamberlin.

The paper concludes, "The Richthofen loess may be said to be first eolian and secondarily aqueous; the Mississippian loess, first aqueous and secondarily eolian. The Richthofen loess in its ultimate origin is residuary; the Mississipian loess in its ultimate origin is glacial."

United States—Montana. **Weed and Pirsson.**

Department of the Interior, Bulletin of the United States Geological Survey. No. 139. Geology of the Castle Mountain Mining District, Montana. By Walter H. Weed and L. V. Pirsson. Washington, 1896. Size 9½ × 6, pp. 164. *Maps and Illustrations. Presented by the Survey.*

United States—New Mexico. **Barker.**

Department of the Interior, United States Geological Survey. Water-Supply and Irrigation Papers of the United States Geological Survey. No. 10. Irrigation in Mesilla Valley, New Mexico. By F. C. Barker. Washington, 1898. Size 9½ × 6, pp. 50. *Map and Plates.*

United States—New Mexico—Indians. **Hodge.**

The Verification of a Tradition. By Frederick Webb Hodge. [From the *American Anthropologist* for September, 1897.] Washington, 1897. Size 9½ × 6½, pp. [4].

Refers to a legend of the Acoma Indians of New Mexico relating to the Mesa Encantada, and a visit paid to that site by the author.

United States—New York. *Globus* **73** (1898): 12–15. **Steffens.**

Gross-New-York. Von Dr. C. Steffens. *With Plan and Illustrations.*

United States—New York State. *B. American G.S.* **30** (1898): 28–56. **Tarr.**

The Physical Geography of New York State. By Ralph S. Tarr. Part iii. Plains and Plateaux. *With Illustrations.*

United States—Oregon. **Diller.**

A Geological Reconnaissance in North-Western Oregon. By J. T. Diller.—Seventeenth Annual Report of the United States Geological Survey . . . 1895–96. Part i. Pp. 447–520. *Map and Illustrations.* Washington, 1896. Size 12 × 8.

CENTRAL AND SOUTH AMERICA.

Argentine Republic—Boundaries. **Delachaux.**
Limites occidentales de la República Argentina. El articulo del Dr. Juan Steffen: La Cuestion de Limite Chileno-Argentina con especial consideracion de la Patagonia. Exámen critico por Enrique S. Delachaux. (Revista del Museo de La Plata. Del Tomo IX., pàg. 1 y siguientes.) La Plata, 1898. Size 11½ × 7½, pp. 78. *Presented by the Museo de La Plata.*

Argentine Republic—Mendoza. *B.A. Nac. Ci. Cordoba* **15** (1897): 425–486. **Bodenbender.**
El suelo y las vertientes de la ciudad de Mendoza y sus alrededores. Por el Doctor Guillermo Bodenbender.

On the geology of the city of Mendoza and its water-supply.

Argentine Republic—Mendoza. *B.A. Nac. Ci. Cordoba* **15** (1897): 487–501. **Doering.**
Observaciones hipsométricas alrededor de Mendoza, practicadas por el doctor Bodenbender y calculadas por el doctor Oscar Doering.

Bolivia—Boundary. **Ballivián.**
Sociedad Geográfica de La Paz, Bolivia. Demarcacion de Limites con los Estados Unidos del Brasil. Documentos compilados y traducidos por Manuel V. Ballivián. La Paz, 1897. Size 8½ × 6, pp. viii. and 108. *Maps. Presented by the Author.*

Brazil—Marajo Island. *Globus* **73** (1898): 90–93, 107–110. **Katzer.**
Eine Forschungsreise nach der Insel Marajó (Amazonas-Mündung). Von Dr. Friedrich Katzer.

The narrative of an exploring journey through the great island of Marajo, at the mouth of the Amazon.

British Guiana. **Kirke.**
Twenty-five Years in British Guiana. By Henry Kirke. London: Low and Co., 1898. Size 9 × 6, pp. x. and 364. *Portrait, Map, and Illustrations. Price* 10*s.* 6*d. Presented by the Publishers.*

A volume of reminiscences of the most interesting kind, picturing social life in all classes of the composite population of British Guiana. Historical facts bearing on the development of the colony are referred to, and the descriptions of journeys in the interior give some information as to the life of the aborigines. An excellent map illustrates the still unsettled question of the Venezuela frontier.

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia Bibliography. **[Petherick.]**
Catalogue of Books relating to Australasia, Malaysia, Polynesia, the Pacific Coast of America, and the South Seas. Offered for sale by Francis Edwards, Bookseller, 83, High Street, Marylebone, London, W. Part I. (A–C), April, 1898. Size 8½ × 5½, pp. 48. *Presented by the Publisher.*

This is the commencement of a catalogue compiled by Mr. E. A. Petherick, of an exceptionally large collection of books bearing on Australasia and the Pacific.

Australia. **Lespagnol.**
Sur le Caractère Désertique de l'Australie intérieure. Par G. Lespagnol. (Extrait des *Annales de Géographie.*) (Nos. 31, 32 et 33, du 15 Janvier, du 15 Mars et du 15 Mai 1898.) Paris: A. Colin & Cie. Size 10 × 6½, pp. [58]. *Maps. Presented by the Author.*

Treats of the surface, the climate, and the hydrographic forms of the desert region of Australia.

Bismarck Archipelago. *Z. Ges. Erdk. Berlin* **32** (1897): 349–359. **Schleinitz.**
Begleitworte zur Karte des östlichen Teils der Insel Neu-Pommern. Von Frhr. von Schleinitz. *With Map.*

This paper, on the eastern part of New Britain, is referred to in the Monthly Record. The map is on the scale of 1 : 500,000.

British Solomon Islands. *Kew B.* (1897): 416–420. ———
British Solomon Islands.

Extracts from the colonial reports on the vegetable resources of the Solomon islands.

Clipperton Atoll. *Quarterly J. Geol. S.* **54** (1898): 228–229. **Wharton.**
Note on Clipperton Atoll (Northern Pacific). By Rear-Admiral Sir William J. Wharton, K.C.B., F.R.S. *With Map and Plates.*

This is summarized in the *Journal* for June, vol. xi. p. 671.

Hawaii. *Ann. G.* 7 (1898): 278–281. **Bellet.**
Les îles Hawaï. Par M. D. Bellet.

Hawaii. *Questions Diplomat. et Colon.* 1 (1897): 588–594. **Servant.**
Havaï. Étude géographique et historique. Par Stéphane Servant.

A study in political geography.

Historical—Mendana. *B.S.G. Paris* 19 (1898): 59–88. **Marcel.**
Mendaña et la découverte des îles Marquises. Par M. Gabriel Marcel. *With Map.*

New Guinea. **Forbes and Thomson.**
Sir William Macgregor's Journey across New Guinea: Correspondence. H. O. Forbes and J. P. Thomson. Brisbane, 1897. Size 9 × 5½, pp. 8. *Presented by Mr. J. P. Thomson.*

New Guinea. **Macgregor.**
Despatch from His Excellency the Lieutenant-Governor of British New Guinea, reporting visit inland to the Western end of the Owen Stanley Range, and thence across the Island to the North and East Coast. [No. 5.] Brisbane, January 26, 1898. Size 13½ × 8½, pp. 20. *Presented by the Colonial Office.*

The full report of Sir William Macgregor's crossing of New Guinea.

New Zealand. **Broderick.**
Reconnaissance Survey of a Road from Tekapo to Mount Cook. By T. N. Broderick. Wellington, 1897. Size 13½ × 8½, pp. 2. *Map. Price 6d. Presented by the Colonial Office.*

POLAR REGIONS.

Antarctic. **Brunner.**
Antarktis. Wege und Ziele der Forschung in der Südpolarregion. Von Heinrich Brunner. Zurich, [1898]. Size 7½ × 5, pp. 24. *Presented by the Author.*

Antarctic. *Petermanns M.* 44 (1898): 66–69. **Supan.**
Die antarktische Forschung. Von Prof. Dr. A. Supan.

Summarizing all the plans for south polar research now before the public, and pointing out the importance of seizing the opportunity of the present favourable climatic conditions.

Arctic—Frobisher Bay. **Porter.**
Frobisher Bay Revisited. By Russell W. Porter. From Bulletin of the American Geographical Society, vol. xxx., 1898, No. 2. Size 10 × 6½, pp. 97–110. *Chart and Illustrations. Presented by the Author.*

Frobisher bay, supposed by the discoverer in 1576 to be the North-West Passage, was first explored to its head by Hall in 1860, but no explorations had been carried out in it since, until the boat expedition under Mr. Porter investigated its whole length (about 150 miles) in 1897.

Arctic—Spitsbergen. *Ymer* (1898): 17–23. **Norselius.**
Special öfver Danskgattet. Af Gustaf Norselius. *With Chart and Illustration.*

The surveys were carried out at Danes island when the Andrée balloon expedition was preparing to start.

Franz Josef Land. **Clarke and Bruce.**
On the Avifauna of Franz Josef Land. By Wm. Eagle Clarke. With Notes by Wm. S. Bruce. (From the *Ibis* for April, 1898.) Size 9 × 6, pp. [30]. *Map. Presented by W. S. Bruce, Esq.*

Greenland. **Astrup.**
With Peary near the Pole. By Eivind Astrup. Translated from the Norwegian by H. J. Bull. London: C. Arthur Pearson, 1898. Size 9 × 6, pp. 362. *Portrait, Map, and Illustrations. Price 10s. 6d. Presented by the Publisher.*

The late Mr. Eivind Astrup, the fact of whose death is not referred to in the preface or elsewhere in the volume, wrote a series of articles for a Norwegian newspaper descriptive of the two expeditions of Mr. Peary to North Greenland, in which he took part, in 1892 and 1893–94. These he subsequently brought together in book form, and the volume is now translated in a very readable manner. A description of the incidents of the journey is followed by some particulars of the Eskimo of the region and their mode of life.

MATHEMATICAL GEOGRAPHY.

Cartography. *Petermanns M.* **44** (1898): 64–66. **Hammer.**
Noch ein Wort zur "Terraindarstellung mit schiefer Beleuchtung." Von Prof. Dr. E. Hammer.

On a method of hill-shading.

Eclipse Calculations. ——
Nautical Almanac Circular, No. 17. Local particulars of the Total Eclipse of the Sun, 1900, May 27–28. Nautical Almanac Office, 1898. Size 10 × 6½, pp. 12. *Maps. Presented by the Director of the Nautical Almanac.*

Geodesy. **Kummell.**
A new solution of a principal Geodetic Problem. By Chas. H. Kummell.—Report of the Superintendent of the U.S. Coast and Geodetic Survey, showing the progress of the work during the Fiscal year ending with June, 1896. Pp. 293–303. Washington, 1897. Size 12 × 9½.

A solution of the inverse problem of the determination of the shortest distance between two points on a spheroid.

Geodesy. *Sitz. A. W. München* (1898): 19–36. **Franke.**
Koordinaten-Transformationen in geodätischen Dreiecknetzen. Von J. H. Franke.

On Soldner's co-ordinates, *i.e.* the rectangular spherical co-ordinates introduced by Soldner in calculating the triangulation of Bavaria in the early part of the present century.

Mathematical. **Putnam.**
Field method of reducing portable transit time observations. By G. R. Putnam.—Report of the Superintendent of the U.S. Coast and Geodetic Survey, showing the progress of the work during the Fiscal year ending with June, 1896. Pp. 347–352. Washington, 1897. Size 12 × 9½.

Navigation. *Nature* **58** (1898): 104–107. **Ruthven.**
Navigation. By Captain J. F. Ruthven. *With Diagrams.*

On methods of laying out great-circle courses.

Position off coasts. *Rev. Maritime* **136** (1898): 461–501. **Jaffré.**
Courant et position exacte d'un navire lorsque, étant en vue d'une côte, on n'en peut relever qu'un seul point. Par M. Paul Jaffré.

Time. *P. and T.R.S. Canada* **2** (1896), (Sect. iii.): 83–90. **Lumsden.**
The Unification of Civil, Nautical, and Astronomical Time. By G. E. Lumsden.

Time. *B.S.G. Paris* **19** (1898): 89–108. **Sarrauton.**
Exposé du système de l'heure décimale. Par Henri de Sarrauton. *With Map.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Biological Geography. *Ann. G.* **7** (1898): 193–200. **Costantin.**
Essai de biologie géographique sur la végétation tropicale. Par J. Costantin.

Calling attention to the importance of geographical environment in the evolution of plants.

Cultivated Plants. **Hahn.**
Wie setzt sich der Bestand der Kulturpflanzen zusammen, von Dr. Hahn.—Separat-Abdruck aus dem Correspondenz-Blatt der deutschen anthropologischen Gesellschaft. Nr. 11. u. 12. 1897. (Bericht der XXVIII. allgemeinen Versammlung in Lübeck.) Size 11 × 9, pp. [8]. *Presented by the Author.*

Geyser Eruption. *American J. Sci.* **5** (1898): 323–333. **Jaggar.**
Some Conditions affecting Geyser Eruption. By T. A. Jaggar, junr.

On experiments tending to elucidate geyser actions.

Meteorology. *T.R.S. Edinburgh* **38** (1896): 579–606. **Gillespie.**
The Weather, Influenza, and Disease: from the Records of the Edinburgh Royal Infirmary for fifty years. By A. Lockhart Gillespie, M.D. *With Diagrams.*

Meteorology. *C. Rd.* **126** (1898): 1173–1176. **Garrigou-Lagrange.**
De l'influence des mouvements de la Lune sur les oscillations de l' atmosphère. Note de M. P. Garrigou-Lagrange.

The author believes that he has found evidence of lunar influence on atmospheric pressure; but the atmospheric tides occur only once daily, not twice as in the case of oceanic tides.

Meteorology. *K. Svensk, Vet.-A. Handlingar* 29 (1897): No. 3. **Hildebrandsson.**
Quelques recherches sur les centres d'action de l'atmosphère. Par H. Hildebrand Hildebrandsson. *With Diagrams.* Pp. 1–36.

A note on this important paper will be given.

Meteorology—Forest Climate. *Meteorolog. Z.* 15 (1898): 134–140. **Schubert.**
Temperatur und Feuchtigkeit der Luft auf freiem Felde, im Kiefern und Buchenbestande. Von J. Schubert.

The average of afternoon observations in the summer months (June to August) showed that the shade temperature in a thick pine wood was 0·5° Fahr. lower and the relative humidity 1 per cent. higher than in the open field, while under the trees of a beech wood the temperature averaged 2° Fahr. lower and the relative humidity 6 per cent. higher than in the open.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. **Hahn.**
Demeter und Baubo. Versuch einer Theorie der Entstehung unsres Ackerbaus. Von Ed. Hahn, Berlin. Lübeck: Max Schmidt [not dated]. Size 9 × 6, pp. 78. *Presented by the Author.*

This treats mainly of mythological and anthropological matters, related to agriculture through early beliefs and customs.

Anthropology. *Rev. Scientifique* 9 (1898): 513–516. **Lombroso.**
Les races et le milieu ambiant. Par M. C. Lombroso.

A discussion showing that certain environments tend to produce and perpetuate distinctive types of man. The author shows how the Jewish race varies physically in different countries, although racially pure in all, while people of entirely different races have kept up the characteristics of Turks, Greeks, Frenchmen, etc., for century after century in the respective countries.

Bishop Martyr's European Journey. *B.S.G. Madrid* 39 (1897), (Suppl.): 1–20. ———
Relación de un viaje por Europa con la peregrinación á Santiago de Galicia verificado á fines del siglo xv. por Mártir, Obispo de Arzenyan.

On the journey to Santiago de Galicia of Martyr, Bishop of Arzenjan in Armenia, at the end of the fifteenth century.

Commercial Geography. *J.R. United Service I.* 42 (1898): 365–405. **Ballard.**
The Protection of Commerce during War. By Commander G. A. Ballard.

Commercial Geography—Rice. *Naturw. Wochenschrift* 13 (1898): 132-138. **Fürst.**
Die Cultur des Reises und der auf Reisfeldern erzielten zweiten Gewächse.

Early Prussian Colonies. **Didier.**
Rev. G. 41 (1897): 357–365, 414–424; 42 (1898): 14–21.
Entreprises coloniales de la Prusse au XVIIe siècle. Par L. Didier.

On the temporary Prussian possessions in the West Indies and Africa, most of them conquests from the Danes and the Dutch.

BIOGRAPHY.

Button. **Christy.**
Admiral Sir Thomas Button, Kt., of Cardiff. By Miller Christy. (Reprinted from the *Transactions* of the Cardiff Naturalists' Society, vol. xxix. part 1, 1896–97). Size 9 × 6, pp. 10. *Presented by the Author.*

Foullon-Norbeeck. *Deutsche Rundschau G.* 20 (1898): 376–377. ———
Heinrich Freiherr v. Foullon-Norbeeck. *With Portrait.*

The subject of this notice was born in Austria in 1850, and, after considerable travels as a geologist in Australasia, was killed by a native in the Solomon Islands on February 27, 1896, while in the act of entering an aneroid-reading in his notebook.

Gilbert. *P. & T.R.S. Canada* 2 (1896), (sect. ii.): 33–39. **Brymner.**
Death of Sir Humphrey Gilbert. By Douglas Brymner, LL.D.

Narrative of the last voyage of Sir Humphrey Gilbert in 1583.

Italian Geographers. **Vedova.**
G. Dalla Vedova. I recenti Lutti della Società Geografica Italiana. Roma, 1898. Size 9½ × 6, pp. 32. *Map and Portraits. Presented by the Author.*

Biographical notices, with portraits, of the late Vittorio Arminjon, who commanded the *Magenta*, the first Italian war-vessel to circumnavigate the world; Admiral Carlo

Alberto Racchia; Cristofero Negri, late president of the Italian Geographical Society; Giuseppe Arimondi; Antonio Cecchi; Vittorio Bòttego and Maurizio Secchi, of whose journeys in Somaliland a map is given.

Marcou. *American J. Sci.* **5** (1898): 398. ———

Prof. Jules Marcou.

Rosignoli. *B.S. Khéliv. G.* **4** (1897): 875–897. **Bonola.**

Don Paolo Rosignoli. Par Dr. F. Bonola bey. *With Portrait.*

Father Rosignoli was one of the prisoners of the Mahdi who succeeded in escaping from the Sudan.

Supan. *Deutsche Rundschau G.* **20** (1898): 374–376. ———

Alexander Supan. *With Portrait.*

Toscanelli. *B.S.G. Italiana* **11** (1898): 246–256. **Baratta.**

Paolo Dal Pozzo Toscanelli iniziatore della scoperta dell' America. Notizie del socio Mario Baratta. *With Portrait and Plate.*

Wauters. *Mouvement G.* **15** (1898): 235–237. **Wauters.**

Alphonse Wauters. Par A. J. Wauters. *With Portrait.*

GENERAL.

Bibliography. ———

International Catalogue of Scientific Literature. Report of the Committee of the Royal Society of London, with Schedules of Classification. March 30, 1898. Size 8½ × 5½. *Presented by the Royal Society.*

British Empire. *J.S. Arts* **46** (1898): 497–511. **Lowles.**

The British Empire: its Resources and its Future. By John Lowles, M.P.

Dwells on the history of the acquisition and on the magnitude of the British Empire. The statement is made, without reference to authorities, that the British Empire "embraces four continents, 10,000 islands, 500 promontories, and 2000 rivers."

British Empire. *G.Z.* **4** (1898): 211–224. **Ratzel.**

Politisch-geographische Rückblicke. Von Friedrich Ratzel. 2. Das englische Weltreich.

A critical study of the relations between the British colonies and the mother-country.

Classification of Geography. ———

Concilium Bibliographicum. Zürich-Oberstrass. 1 April 1898. Conspectus Methodicus. Size 9 × 6, pp. 16. *Presented by the Concilium Bibliographicum.*

This contains a subdivision of the Earth's surface for bibliographical purposes, commencing with oceans and continents, and carried down as far as French departments and British counties.

Colonies of Spain and Portugal. **Zimmermann.**

Die Europäischen Kolonien. Erster Band. Die Kolonialpolitik Portugals und Spaniens in ihrer Entwickelung von den Anfängen bis zur Gegenwart dargestellt von Dr. Alfred Zimmermann. Berlin: E. S. Mittler und Sohn, 1896. Size 9½ × 6, pp. xvi. and 516. *Map.*

An important study of historical geography, tracing the rise and decline of the colonial empires of Portugal and Spain.

Commercial Geography—Railways. **Radtsig.**

Influence of Railways on Agriculture, Industry, and Trade. Anton Radtsig. [In Russian.] St. Petersburg, 1896. Size 10 × 7, pp. 268. *Diagrams. Presented by the Author.*

This volume deals with the railways of the world in general, comparing different countries, and then in detail with the railways of Russia, and the economic results of their increasing length. There are numerous statistical diagrams.

Cosmogony. **Skwortzow.**

Soleil, terre et électricité. (Un chapitre de la théorie nouvelle de l'univers.) Par le prof. Jr. Skwortzow. Kharkow, 1898. Size 10½ × 7, pp. 8. *Presented by the Author.*

Decimal Division of Angles. **Carrière.**

Société d'Étude des Sciences naturelles de Béziers. Extrait du Bulletin Mensuel, No. 2, Février 1898. Rapport sur l'application du Système Décimal à la Mesure du

Temps and de la Circonférence. Par M. L. Carrière. Béziers: H. Azais, 1898. Size 10½ × 6½, pp. [12]. *Presented by the Author.*

Education—Methods. *Mouvement G.* **15** (1898): 156–158, 168–170. **Renard.**
L'enseignement de la Géographie. Par A. F. Renard.

Education—Methods. *Mouvement G.* **15** (1898): 118–122. **Renard.**
La Géographie à l'Université de Vienne. Par A. F. Renard.

An account of Prof. Penck's methods of geographical teaching in Vienna.

Educational Methods. *G.Z.* **4** (1898): 274–287. **Krug.**
Amerikanische Lehrbücher für den Geographie-Unterricht. Von M. Krug.

On American school books on geography.

French Colonization. *Questions Dipl. et Colon* **4** (1898): 22–34. **Halot.**
L'aptitude des Français à coloniser, démontrée par les résultats obtenus dans leurs dernières Colonies. Par Alexandre Halot.

General. **Cust.**
Linguistic and Oriental Essays. Written from the year 1840 to 1897. Fifth Series. By Robert Needham Cust, LL.D. 2 vols. London: Luzac & Co., 1898. Size 8¾ × 6, pp. xiv. and 1076. *Portrait. Presented by the Author.*

A collection of essays and newspaper articles extending over a considerable period and touching on many topics. Several are devoted to studies of native life in India, a large number to subjects related to historical geography, and a few to general questions regarding the development of Africa.

Geographical Education. *Petermanns M.* **44** (1898): 90–93. ———
Der geographische Unterricht an den deutschen Hochschulen im Sommersemester, 1898.

List of the courses of instruction in geography now being delivered in the German universities.

Geographical Progress. *B.S.G. Paris* **19** (1898): 5–58. **Hulot.**
Rapport sur les travaux de la Société de Géographie et sur les progrès des sciences géographiques pendant l'année 1897. Par M. le baron Hulot. *With Maps.*

This report is daintily illustrated by a series of small sketch-maps of routes.

Geographical Progress. *B.S.G. Paris* **17** (1896): 409–517. **Maunoir.**
Rapport sur les travaux de la Société de Géographie et sur les progrès des sciences géographiques pendant l'année 1895. Par Ch. Maunoir.

Geographical Progress. *B. American G.S.* **30** (1898): 124–126. **Littlehales.**
Recent Advances in Geographic Knowledge, accomplished by the U.S. Hydrographic Office. By G. W. Littlehales.

On the work of the U.S. Hydrographic Office in determining telegraphic longitudes, and in surveying coasts for charts.

Geographical Year-book. **Wagner.**
Geographisches Jahrbuch. XX. Band. 1897. Herausgegeben von Hermann Wagner. Zweite Hälfte. Gotha: Justus Perthes, 1898. Size 9 × 6, pp. 249–510.

In this part, completing vol. xx., Prof. E. Hammer gives a paper on recent progress in cartographic processes; Dr. Hergesell and Dr. Rudolph treat of geophysics; Dr. Tiessin on Asia without Russia; and Prof. Anuchin on Asiatic Russia. Dr. Wolkenhauer gives the customary Necrology, with an index to the obituary notices of the last ten years.

Geography in America. *Science* **7** (1898): 541–551. **Baker.**
A Century of Geography in the United States. By Dr. Marcus Baker.

This paper quotes extracts from American geographical text-books of a hundred years ago, and gives an outline of recent advances towards a complete geographical knowledge of the United States through the various national surveys.

German Colonies. ———
Jahresbericht über die Entwickelung der Deutschen Schutzgebiete im Jahre 1896–97. Beilage zum Deutschen Kolonialblatt 1898. Berlin: E. S. Mittler & Sohn, 1898. Size 12½ × 9, pp. 156.

Travels. **Buxton.**
Short Stalks. Second Series. Comprising trips in Somaliland, Sinai, the Eastern Desert of Egypt, Crete, the Carpathian Mountains, and Daghestan. By Edward

North Buxton. London: Edward Stanford, 1898. Size 9½ × 7, pp. xii. and 226. *Maps and Illustrations. Price 21s. Presented by the Publisher.*

In this volume Mr. Buxton describes hunting expeditions in Somaliland, the Carpathians, the Egyptian Red Sea coast, the Sinaitic peninsula, Crete, and Daghestan. There is an important map of Somaliland, showing the new boundaries and much fresh information, and there is also a map of part of the Sinaitic peninsula. The illustrations from the author's photographs are excellent, and the book is a worthy continuation of the first series of 'Short Stalks.'

Year-Book. **Keltie and Renwick.**

The Statesman's Year-book, Statistical and Historical Annual of the States of the World for the year 1898. Edited by J. Scott Keltie, LL.D., with the assistance of I. P. A. Renwick, M.A., LL.B. London: Macmillan & Co., 1898. Size 7½ × 5, pp. xxx. and 1166. *Maps and Diagrams. Price 10s. 6d. Presented by the Publishers.*

In addition to the careful revision of all the statistical information regarding the countries of the world, this year's issue contains a series of maps and diagrams. The maps show the political condition of the Niger region in Africa, and the distribution of British trade over the world. The trade maps are coloured to show the proportion of British imports to total imports in each country, and only those towns are shown in which there is a British consular or diplomatic representative. The diagrams are modified statistical curves showing the total imports and exports of the principal countries for the last 25 years.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Bartholomew.**

New Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheets: 11, North Wales; 18, Birmingham District; 30, Surrey; 31, Kent. J. Bartholomew & Co., Edinburgh, 1898. *Price 2s. each, mounted on cloth. Presented by the Publishers.*

England and Wales. **Ordnance Survey.**

Publications issued since May 8, 1898.

1-inch—General Maps:—

ENGLAND AND WALES:—18, 27, 41, 122, 123, 342, engraved in outline (revision). 1s. each.

6-inch—County Maps:—

ENGLAND AND WALES (revision):—**Durham,** 4 S.E., 6 [S.E., 7 S.E. **Essex,** 11 N.W., 15 N.W., 16 N.W., N.E., S.W., 19 S.W., 25 N.W., 26 N.W., S.W. 36 N.E., 37 N.W., 38 S.E., 45 N.E., 46 N.E., S.E., 47 N.W., 54 N.W., 69 N.W., 70 S.E., 75 N.W., 80 N.E. **Hampshire,** 21 S.W., 44 S.E., 52 N.E., 65 S.W., 72 N.W., 74 N.W., 76 N.W. **Kent,** 10 S.W., 21 S.E., 33 N.E., 43 N.W., 44 N.W., S.W., 50 S.W., 51 S.E., 52 S.E., 53 N.W., N.E., S.W., S.E., 61 S.E., 62 N.W., S.W., 63 N.E., 64 N.W., S.E. **Northumberland,** 41 N.W., S.W., S.E., 42 N.E., 49 N.E., 50 S.E., 51 S.W., 53 S.W., S.E., 54 S.W., 61 S.W., S.E., 62 S.W., S.E., 63 N.W., N.E., S.W., 64 N.W., 65 N.W., S.W., 66 N.E., 68 S.E., 69 N.E., S.W., S.E., 71 N.E., 72 S.W., 83 N.E., 84 S.W., 89 N.W., 92 N.W., N.E., 103 N.W., S.W., 106A S.E. **Surrey,** 10 N.E., 21 N.E., S.E., 22 N.E., S.E., 24 S.W., 32 N.E., 34 N.W., N.E., 35 N.W. 1s. each.

25-inch—Parish Maps:—

ENGLAND AND WALES (revision):—**Cheshire,** III. 8, 11, 16; IV. 10; IX. 11; XI. 6; XVII. 14, 15, 16; XVIII. 7, 13; XIX. 1; XX. 10; XXVI. 7, 10, 11, 12; XXVII. 1, 5; XXIX. 13; XXXV. 5, 13; XXXVI. 3; XLI. 12; XLII. 1, 9, 13; XLVIII. 7, 8, 11, 12, 16; XLIX. 2, 9, 11, 12, 13; L. 6; LV. 4, 6; LVI. 1, 4, 10; LVII. 3, 5; LXI. 3; LXII. 2, 4, 6, 7, 8, 9, 13. **Derbyshire,** III. 9; IV. 13; V. 3, 7, 11, 15, 16; VI. 4, 7, 8, 15, 16; VII. 9, 10, 13, 14; IX. 3, 6, 8, 9, 10, 11, 12; X. 1, 2, 3, 4, 6, 7, 8, 10, 11, 15; XI. 9, 13, 14; XII. 10. **Durham,** II. 9, 10. **Essex,** VII. 12. **Hampshire,** LXXV. 15; LXXIX. 10, 14; LXXXIII. 2, 9, 14; LXXXVII. 7, 8, 10; XCIV. 9, 13; XCV. 2, 9; XCVI. 9, 11, 15; XCVII. 1, 6, 7, 8, 12, 16; XCVIII. 1, 5, 6, 9. **Hertfordshire,** II. 13; IV. 11, 15, 16; V. 9, 13, 14; VII. 7, 10, 14; VIII. 4; IX. 1, 16; XI. 4, 7, 10; XIV. 4, 8; XIX. 3, 7; XX. 13; XXI. 15; XXVII. 4, 16; XXVIII. 4, 9, 14; XXIX. 10, 13, 16; XXX. 6, 7, 8, 11, 12; XXXIV. 5; XXXV. 9; XXXVI. 1, 2, 4, 8, 16; XXXIX. 3, 14; XL. 2; XLI. 11; XLIII. 8, 12; XLIV. 7, 8; XLV. 4, 10, 12, 15, 16; XLVI. 1, 5, 9, 13. **Kent**, V. 15; XIX. 9; XXIV. 14, 15; XXVI. 5, 10, 13, 14; XXXIV. 9; XXXVI. 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XLVI. 14, 16; XLVII. 10; LXVII. 4, 15; LXXII. 13; LXXV. 1; LXXX. 1; LXXXI. 1, 2, 4, 6, 7, 8, 9, 10, 11; LXXXIV. 1, 5, 6, 10, 16; LXXXVI. 3, 7, 8, 11, 12. **Northumberland**, VIII. 14, 15. **Surrey**, XXIX. 12; XLIV. 4; XLVII. 2. **Sussex**, I. 15; II. 8; III. 2; IV. 4; LX. 16; LXI. 7; LXV. 7, 8, 9; LXVI. 16; LXXIII. 13; LXXIV. 1, 5, 6, 9. **Westmorland**, XXIX. 6, 7, 10, 11, 12, 16; XXX. 5, 6, 7, 9, 10. 11, 13, 14, 15; XXXIV. 7, 15; XXXV. 4, 8, 12, 13; XXXVI. 1, 3, 5, 7, 9, 11; XXXVIII. 3, 4, 6, 7, 9, 10, 11, 12, 13, 15; XXXIX. 2, 3, 4, 5, 8; XL. 1, 5; XLI. 4, 12; XLII. 7, 8, 10, 12, 15, 16; XLVI. 11, 12, 14, 15, 16; XLVII. 6, 7, 9, 14, 15; XLVIII. 2, 6, 9; L. 4; LI. 1. 3*s*. each.

(*E. Stanford, Agent.*)

Harz Mountains. **Bomsdorff.**

O. v. Bomsdorff's Spezial-Karte vom Harz. Scale 1 : 100,000 or 1·5 stat. mile to an inch. In 4 sectionen: 1, Oberharz; 2, Thale; 3, Lauterberg; 4, Stolberg. Albert Rathke's Verlagsbuchhandlung, Magdeburg. *Price* 1 *mark each section. Presented by the Publisher.*

London. **Jordan.**

Geological Model of London and Suburbs. By James B. Jordan. The geology compiled from the maps of the Geological Survey. Surveyed principally by W. Whitaker, Esq., B.A., F.R.S. Horizontal scale, 1 : 63,360 or 1 stat. mile to an inch; vertical scale, 1 : 12,000 or 1 inch to 1000 feet. E. Stanford, London. 1898. *Price* 15*s*.

This is a relief model representing an area of 320 square miles, with London as a centre. It includes the administrative county of London, and extends beyond the county boundary to Finchley on the north, Croydon on the south, St. Mary Cray and Plumstead on the east, and Twickenham and Harrow on the west. The map is geologically coloured, and contains sections, and vertical sections of strata at bore-holes.

The model was originally constructed by Mr. Jordan in contours of cardboard, and reproduced in tinned steel plate. The advantage of this is its superior durability and lightness.

Switzerland. **Menghius.**

Sprachenkarte von Graubünden und Tessin. Nach den Ergebnissen der Volkszählung von 1888. Scale 1 : 450,000 or 7 stat. miles to an inch. Von M. C. Menghius. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 7. Gotha: Justus Perthes, 1898. *Presented by the Publisher.*

ASIA.

China. **Morse.**

Map of the province of Kwangsi. By H. B. Morse. To accompany Lungchou Trade Report for 1897. *Presented by the Author.*

This map has been compiled from the manuscript map of the Rev. Père Renault, and from the map by T. Piry, French topographic map of Tokin, and Chinese sources. The map is without hill shading, but trade routes are laid down, and the names of places are in Chinese character, with the addition of the names in English of all the principal places.

Shantung. **Reimer.**

Deutschland in Ostasien. Provinz Shantung mit der Kiau-Tschou-Bucht und den Kohlenfeldern von Po-Shan-Hsiën. Scale 1 : 750,000 or 11·8 stat. miles to an inch. Berlin: Dietrich Reimer (E. Vohsen), 1898.

AFRICA.

Africa. **Bartholomew.**

Bartholomew's Political Map of Africa. Scale 1 : 12,000,000 or 189·3 stat. miles to an inch. J. Bartholomew & Co., Edinburgh, 1898. *Price* 3*s*., *mounted on cloth. Presented by the Publishers.*

This is a new edition of Bartholomew's Political Map of Africa, which has been corrected and brought up to date, with the exception of the boundary of British Somaliland, as fixed by the Anglo-Ethiopia treaty, July 28, 1897, and consequently territory is shown as British which has been ceded to Abyssinia.

Africa. **Service Géographique de l'Armée, Paris.**

Carte de l'Afrique. Scale 1 : 2,000,000 or 31·1 stat. miles to an inch. Sheets : 53, Windhoek ; 54, Vyrburg ; 58, Port Nolloth. Service Géographique de l'Armée, Paris. *Price* 1 *fr. each sheet.*

Algeria. **Service Géographique de l'Armée, Paris.**

Carte d'Algerie. Scale 1 : 50,000 or 0·78 stat. mile to an inch. Sheets : 95, Châteaudun du Rhumel ; 157, Zemmora. Dressé, heliogravé et publié par le Service Géographique de l'Armée, Paris. *Price* 1.50 *fr. each sheet.*

Matabeleland. **Mitchelson.**

A Mineral Map of Matabeleland. Compiled from original sources by Sydney P. Mitchelson. Published for the Rhodesia Publishing Syndicate, 1898. Scale 1 : 633,600 or 10 stat. miles to an inch. E. Stanford, London, 1898. *Price* £1 1*s.*

Somaliland. **Stanford.**

Map of Western Somaliland. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. E. Stanford, London, 1898. *Presented by the Publisher.*

This map has been compiled from the route surveys of Major Swayne, R.E., Colonel Paget, Count Hoyos, Dr. D. Smith, Mr. Parkinson, Count Wickenburg, and others, with additions from the itineraries of Mr. Alfred E. Pease, M.P. The boundary of the British Somali Protectorate, 1897, is laid down, and an inset is given, showing the area ceded to Abyssinia by the Anglo-Ethiopia Treaty, July 28, 1897.

West Africa. **Stanford.**

A Map of part of West Africa, including the Gold Coast, Lagos, the Niger Coast Protectorate, and part of the Royal Niger Company's Territory, 1898. Scale 1 : 1,900,800 or 30 stat. miles to an inch. E. Stanford, London, 1898. *Presented by the Publisher.*

This map includes the west coast of Africa from the eastern portion of the Ivory Coast to the old Calabar river, and the country inland as far as 14° 20′ N.

AMERICA.

British North-West America. **Surveyor-General's Office.**

Canadian Government Surveys : Yukon Map. Scale 1 : 380,160 or 6 stat. miles to an inch. Sheets 2, 3, 4, 5, 6, 7, 8, 9, 10. Surveyor-General's Office, Ottawa, 1898. *Price 25 cents each sheet. Presented by the Surveyor-General of Canada.*

These sheets of the Canadian Government Survey include the Yukon goldfields and the country between them and the west coast. The area embraced commences at the mouth of the Stikine river, and the west line is followed to Yakutat bay and the slopes of the Mount St. Elias range ; then it follows the 149th meridian to lat. 66° 20′ N., thus including the Klondike region. To the east these sheets include the lakes and upper waters of the Yukon and Pelly rivers, numerous heights are given, and all the trails are laid down.

As these sheets contain the results of actual survey, and are drawn on the scale of 6 miles to the inch, they will be of great service to all who are visiting the Klondike region, but especially to those who are using any of the west coast routes.

Canada. **Stanford.**

Stanford's General Map of the Dominion of Canada and Newfoundland. Scale 1 : 5,274,720 or 83·2 stat. miles to an inch. E. Stanford, London, 1898. *Presented by the Publisher.*

Cartagena. **Hart.**

Plan of the City of Cartagena, showing the location of the Tracks, Buildings, and Wharves of the Cartagena Terminal and Improvement Co., Ltd., and Cartagena-Magdalena Railway Co. Scale 1 : 9,820 or 1 inch to 0·155 stat. mile. By F. R. Hart. 1898. *Presented by the Author.*

United States and Spain. **Bartholomew.**

Bartholomew's Spanish-American Special War Map. North Atlantic, United States, Spain, and Cuba. With inset maps of Havana and other chief ports. New Edition. J. Bartholomew & Co., Edinburgh, 1898. *Price* 1*s.* 6*d. on cloth. Presented by the Publishers.*

AUSTRALASIA.

New Guinea. **Petermanns Geographische Mitteilungen.**

Der Untere Bubui mit der Missionsstation Simbang. Scale 1 : 40,000 or 0·63 stat. mile to an inch.—Die Tami (Crétin) Inseln vor der No. Ecke des Huon-Golfes.

Scale : 20,000 or 0·31 stat. mile to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 8. Langhans' Beiträge zur Kenntnis der Deutschen Schutzgebiete Bl. 11. Gotha: Justus Perthes, 1898. *Presented by the Publisher.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during March and April, 1898. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
850 m	= 9·4	North Holland:—Ymuiden harbour. 1*s*. 6*d*.
2994 m	= 1·75	Great Belt:—Sprogö to Omö. 2*s*. 6*d*.
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2990 m	= 4·9	France, north coast:—Le Havre and entrance to the Seine. 2*s*. 6*d*.
1660 m	= 0·5	Greece:—Gulf of Corinth. 2*s*. 6*d*.
2963 d	= 4·1	Arctic Russia:—Gulf of Ob (Obskoi Gubi), and gulf of Yenesei (Yeneseiskago Saliva). 2*s*. 6*d*.
1535 m	= 7·2 = 2·17	Plans on the east coast of Iceland:—Seidis fiord, Nord, Hellis, and Vid fiords. 1*s*. 6*d*.
1531 m	= var.	Anchorages in the strait of Belle isle:—Black bay, Pinware bay, Anse à Loup. 1*s*. 6*d*.
1534 m	= 5·9	Newfoundland, east coast:—Western or Hauling arm. 1*s*. 6*d*.
2961 m	= 1·2	Lake Ontario:—Eastern part of the Bay of Quinté, Kingston to Deseronto. 2*s*. 6*d*.
1524 m	= var.	Plans in Alaska:—Juneau anchorage, Wrangell harbour, Ratz harbour, Tongass narrows, Tolstoi bay. 1*s*. 6*d*.
1291 m	= 1·1 1·9	Anchorages on the west coast of Africa:—Sette Cama anchorage, Lendana bay. 1*s*. 6*d*.
2987 m	= 0·73	Philippine islands:—San Pedro bay to Libukan islands, including Juanico strait. 2*s*. 6*d*.
2974 m	= 1·0	China, east coast:—Chang-tau harbour and approaches. 1*s*. 6*d*.
2995 m	= 4·0	South Pacific ocean:—Suloga harbour (Woodlark island). 1*s*. 6*d*.
1512 m	= 1·0	New Zealand:—Anchorages on and off the north coast of North island:—Three Kings islands, Port Mangonui. 1*s*. 6*d*.
215 d	= 2·95	Pacific ocean:—New Caledonia Isle of Pines, to New Zealand North cape. 2*s*. 6*d*.
2283 d	= 2·88	Pacific ocean:—Tongatabu island to L'Esperance rock. 2*s*. 6*d*.
1660 m	= 3·0	Fiji islands:—Suva harbour. 2*s*.
2971 m	= var.	North Pacific ocean:—Fanning island, English harbour, Whaler anchorage. 2*s*. 6*d*.
2399		Gulf of Pyrgos or Burghaz:—Plan added, Messemvria to Cape Emineh.
1936		Plans in the North Pacific ocean:—New plan, Roca Partida, plans added, San Benedicto island, Malpelo island.
724		Islands and reefs between Seychelles and Madagascar:—Plan added, Coetivey island.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
850	Ymuiden harbour.	New Chart. Ymuiden harbour	850
2646	Plan of entrance to Loire river on this sheet.	New Sheet. Entrance to the Loire river and approaches to St. Nazaire	2989
1600	Gulf of Corinth, or Lepanto.	New Chart. Gulf of Corinth	1600
1791	Port Monganui.	New Chart. Anchorages on and off the north coast of North island	1512
2867	Plans of Fanning island and English harbour on this sheet.	New Chart. Fanning island, English harbour, Whaler anchorage	2971

Charts that have received Important Corrections.

No. 2057, Ireland, west coast:—Westport bay. 124, Netherlands:—The Texel. 2269, White sea:—Cape Cherni to Mount Sozonova. 2276, White sea:—Bouin point to Sharapov head. 2273, White sea:—Nikodimskoi and Intsi points to Kammenoi point, etc. 2302, Gulf of Bothnia:—Tome point, round the head of the gulf to Tauvo. 696, Germany:—Kiel harbour. 2714, Portugal, west coast:—Port Setubal. 2835, Black sea:—Delta of the Danube, etc. 2232, Black sea:—Odessa to Sevastopool. 2230, Black sea:—Bosphorus to Cape Kaliakra. 2234, Sea of Azov. 1645, Asia Minor:—Island of Khios and Gulf of Smyrna. 369, plans in the Cape Verde islands. 2240, Iceland:—Approach to Grundar and Kolgrafa fiords. 2172, Bering strait. 282, Newfoundland:—St. John bay to Orange bay and strait of Belle isle. 2902, Newfoundland, east coast:—Motion head to Flat rock point, showing the approaches to St. John's harbour. 1731, Lake Huron:—Parry sound and approaches. 330, North America:—Lake and River St. Clair, with the Detroit river. 1441, West Indies:—Turks islands. 2044, South America, east coast:—Ilha Grande and Sapetiba bays. 23, Chile:—Channels between Magellan strait and Gulf of Trinidad. 24, Chile:—Channels between Gulf of Trinidad and Gulf of Peñas. 572, British Columbia:—Constance cove. 1500, Alaska:—Kadiak island to Siguam island. 1499, Alaska:—Cross island to Kadiak island. 397, Africa, west coast:—River Volta, etc. 1360, Africa, west coast:—Barako to Cape St. Paul. 1713, Africa, west coast:—Anchorages on the west coast of Africa. 1456, Africa, west coast:—River Cameroon, with the Ambas islands. 7, Gulf of Aden:—Aden and adjacent bays. 828, Bay of Bengal:—Cape Comorin to Cocanada. 2761, Sumatra, west coast:—Tyingkok bay to the Strait of Sunda. 941B, Eastern Archipelago, western portion, etc. 895, plans of anchorages in Bali, Lombok, etc. 2637, Strait of Makasser, south part. 2194, plans of anchorages in the north part of Celebes. 930, Anchorages between Borneo and New Guinea. 989, China sea:—Lakon roads to Lem Tane. 2725, Gulf of Siam:—Koh Tron and channels leading to anchorages off Kamput. 2062, Cochin China:—Tong King gulf. 1961, Pescadores islands. 2376, Harbours in Formosa. 2809, Yang-tse Kiang:—Shanghai to Nanking. 2347, Japan:—Nipon, Kiusiu, and Shikoku, etc. 2441, Japan:—Tsugaru strait. 2432, Tartary:—Tumen Ula to Strelok bay, etc. 2759A, Australia, northern portion, etc. 2766, North-east coast of New Guinea, etc. 780, Pacific ocean:—South-west sheet. 1829, Pacific ocean:—Fiji islands to Samoa islands. 1830, Pacific ocean:—Ellice islands to Phœnix islands. 767, Tuamotu or Low archipelago and the Society islands. 2867, Islands and anchorages in the North Pacific ocean.

(*J. D. Potter, Agent.*)

United States Charts. **U.S Hydrographic Office.**

Pilot Charts of the North Atlantic and North Pacific Oceans for May and June, 1898. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

GENERAL.

The World. **Vivien de Saint Martin and Schrader**

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Paris: Librarie Hachette et Cie. Sheets 76 and 76 bis. *Price 2 fr. each sheet.*

The World. **Andree.**

Andrees allgemeiner Handatlas, 126 Haupt- und 130 Nebenkarten auf 186 Kartenseiten, nebst alphabetischen Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Bielefeld und Leipsig: Verlag von Velhagen & Klasing, 1898.—Lief 12, Uebersichtskarte von Österreich-Ungarn, Westrussland, Südlicher Teil.—Lief 13, Ost-Frankreich: England und Wales, Nördliche Hälfte.—Lief 14, Isobaren und Winde im Januar und Juli. Niederschlagsmengen Jahreszeitliche Verteilung der Niederschläge: Schweden und Norwegen, Südlicher Teil.—Lief 15, Untere Donauländer und Türkei, Ostliche Halfte: Nordöstliches Afrika.—Lief 16, Isothermen der Luft im Januar, Juli und Jahresdurchschnitt. Linien Gleicher Mittlerer Jährl. Wärmeschwankung: Verkehrskarte der Nord- und Ostsee.

World. **Bartholomew.**

The Citizen's Atlas. One hundred maps and gazetteer. By J. G. Bartholomew, F.R.G.S. Published by George Newnes, Ltd., London. To be completed in 20 parts. Parts 1 to 8. *Price 6d. each.*

Eight parts of this atlas have already appeared, and it is to be completed in twenty parts issued fortnightly. The plates of which it is composed, are those of Bartholomew's

"Library Reference Atlas," corrected and brought up to date. The maps are very clearly drawn, and, at the price it is now offered, it is a remarkably cheap atlas.

PHOTOGRAPHS.

British Central Africa. **Weatherley.**

126 Photographs of British Central Africa, taken by Poulett Weatherley, Esq. *Presented by Poulett Weatherley, Esq.*

Owing to Mr. P. Weatherley's absence from England, the titles of these photographs have not been furnished. They, however, include photographs of scenery and natives, taken chiefly in the neighbourhood of Lake Bangweulu, and have been admirably produced from Mr. Weatherley's negatives by the Stereoscopic Company.

Central Africa. **Crawford.**

Fourteen Photographs of Garenganze Country, Lake Mweru District, etc , taken by Mr. D. Crawford. *Presented by F. S. Arnot, Esq.*

This interesting set of photographs contains a series of subjects which have been well chosen to convey an idea of the scenery and native life of this part of Africa. The following is a list of the titles:—

(1) Vasera (fisher tribe), Lake Mweru; (2) Vasera chief, Lake Mweru; (3) Building missionaries' house, Luanza, free labour; (4) Vasera chief and wives, Lake Mweru; (5) Johnston Falls, Luapula river, looking south; (6) Missionaries' first camp, on site of Johnston Falls Sta, Luapula river; (7) Livingstone's tree, Ilala, fenced round by Mr. and Mrs. Crawford; (8) Livingstone's tree, Ilala; (9) Uluba woman, Lualaba river, side view; (10) Uluba woman, front view; (11) Usera chief and wives, Lake Mweru (12) Mr. Pomeroy and Katanga natives; (13) Mr. Garman and Katanga natives; (14) Mwena Mission Station, Lufira valley, Garenganze country, or Katanga.

Colombia. **Hart.**

Album containing 38 photographs of the neighbourhood of Cartagena, Republic of Colombia, taken by F. R. Hart, Esq. *Presented by F. R. Hart, Esq.*

The following is a list of the contents of this album:—

(1) Palace of Justice and ruined church; (2) Street scene; (3) Plaza Rafael Nuñez; (4) In the outskirts of the city; (5) Between the wall and the houses; (6) The wall towards the sea; (7) A part of the walls; (8) On top of the walls; (9) Convent of La Popa and fortress of San Felipe; (10) House of the late president, Dr. Nunez; (11) Gateway to fort at Boca Chica; (12) Top of fort at Boca Chica; (13) Bridge (Puenta Media Luna) connecting the city with the mainland; (14) Railway shops at Cartagena; (15) Engine house; (16) Car shops; (17) Interior of car shops; (18) Interior of machine shop; (19) Storehouse for railway supplies; (20) Between Cartagena and Turbaco (Coral ballast); (21) Between Cartagena and Turbaco (cattle country); (22) Between Cartagena and Turbaco (entrance to plantation of Santa Ysabel); (23) Between Cartagena and Turbaco (cut near summit); (24) Station at Arjona; (25) Trestle between Turbaco and Arjona; (26) Cut between Arjona and La Viuda; (27) Tracks through plantation of La Viuda; (28) Clearing on La Viuda; (29) The first settlement at La Viuda; (30) La Viuda twenty months afterwards; (31) La Viuda, overseer's house; (32) Young bananas at La Viuda; (33) Banana plants at La Viuda about eighteen months old; (34) Trestle near Soplaviento; (35) Magdalena river at Calamar; (36) Magdalena river-boat; (37) Interior of steamboat *M.A. Caro;* (38) "Rhode island," 38-ton locomotive.

Mount St. Elias Range. **Bryant.**

Panorama of the Mount St. Elias Range, Alaska, in two parts, taken by Prof. H. G. Bryant, M.A., LL.B., 1897. *Presented by Prof. H. G. Bryant.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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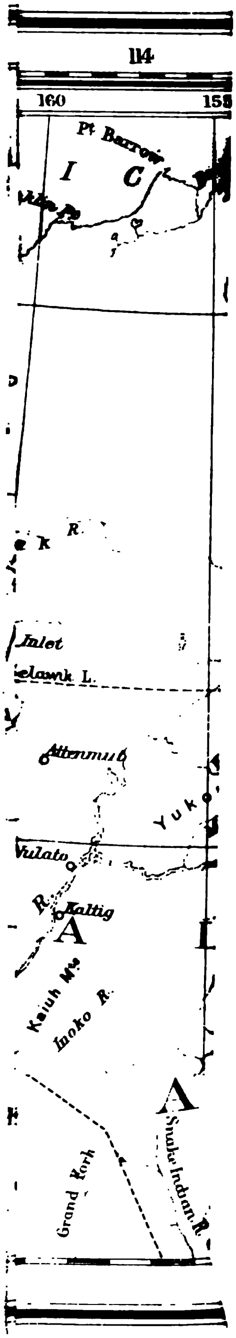

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Geographical Journal.

No. 2. AUGUST, 1898. Vol. XII.

ON THE ANNUAL RANGE OF TEMPERATURE IN THE SURFACE WATERS OF THE OCEAN, AND ITS RELATION TO OTHER OCEANOGRAPHICAL PHENOMENA.*

By Sir JOHN MURRAY, K.C.B., F.R.S., LL.D., D.Sc.

(*Of the "Challenger" Expedition.*)

1. Introductory.

Temperature may be defined as that state of matter on which depends its relative readiness to give or to receive heat. Variations of temperature are intimately associated with all changes in nature, and no investigation is more important or more interesting to the scientific man than the study of these temperature variations, and their relation to other natural phenomena. In the present communication, it is proposed to consider with some detail the temperature variations which take place in the surface waters of the ocean during the course of the year, and to indicate some of the physical and biological phenomena which appear to be directly or indirectly connected therewith.

On the dry land there is often a very wide *daily* range of temperature in the air immediately resting upon the ground. The temperature at the surface of the sandy deserts of the tropics frequently rises during the day to 120° or 140° Fahr., and more rarely to 200° Fahr.; and when these hot particles of dust are lifted into the air by winds, the temperature of the air rises occasionally to 125° Fahr. in the shade, while during the night the temperature sometimes falls below the freezing-point. Rock surfaces in the tropics, which during the day are heated up to 137° Fahr., are cooled so rapidly by radiation at night that, unable to sustain the strain of contraction, they split, and throw off sharp angular fragments from a few ounces to 100 or 200 lbs. in weight.[*] Cold rain falling on these sun-heated rocks produces a similar effect.[†] At Atacama, in South America, a range of temperature amounting to 91° Fahr. has been recorded in four hours.[‡]

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* Read at the Royal Geographical Society, February 28, 1898. Map, p. 224.

The *annual* range of temperature is likewise very great at some places on the land-surfaces. At Werkojansk, in Siberia, the range of temperature between the mean of the coldest month and the mean of the warmest month is 120° Fahr.; and at this place, in February 1892, the temperature fell to – 93°·6 Fahr., being absolutely the lowest temperature of the air hitherto recorded. The *extreme* range of temperature of the air which may be found upon the land-surfaces as a whole, as distinct from the daily or annual range at any one spot, is known to exceed 220° Fahr.

When we turn to a consideration of the changes of temperature which occur in the surface waters of the ocean, it is found that these are much less rapid, and that the *daily* and *annual* range at any one spot, and the *extreme* range of temperature from equator to pole, are all very much less than on the land-surfaces. This result is due to the great thermal capacity of water, and to the fact that most of the light and heat rays are absorbed on passing through the surface-layers of the water. The high specific heat of water precludes such a rapid rise or fall of temperature as takes place on land. When the temperature of the water is raised, evaporation tends to check the rapidity of the rise; when the temperature falls, condensation of the superincumbent vapour checks the rapidity of the fall, and, when a low temperature is reached, freezing sets in, again retarding the fall.

The mean *daily* range of temperature in the surface-waters of the North Atlantic, as determined from the *Challenger* observations, made on 126 days from March to August, 1873, and in April and May, 1876 (mean lat. 30° N., mean long. 42° W.), was only 0°·8 Fahr.; while the amplitude of the daily variation in the temperature of the air over the sea on the same 126 days was 3°·21 Fahr., or four times greater than that of the sea over which it lies.[§] During this time the *Challenger* was near land on 76 days, and on these days the diurnal variation was 4°·38 Fahr., thus showing a larger range in the temperature of the air when near land than when out in the open sea. An examination of the temperatures taken by the *Challenger* in other parts of the globe renders it highly probable that nowhere in the open ocean does the mean daily fluctuation of the temperature of the surface water amount to 1° Fahr.; hence, the atmosphere over the ocean may be regarded as resting on, or blowing over a surface, the temperature of which is practically uniform at all hours of the day, being thus a striking contrast to what takes place on the dry land.

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[*] Livingstone, 'Zambesi,' pp. 492, 516. London: 1865.

[†] Stanley, *Proc. R. G. S.*, vol. xx. p. 142, 1876.

[‡] Viz. from 7° Fahr. at 7 a.m. to 98° Fahr. at 11 a.m. (J. Harding, *Jour. R.G.S.*, 1877, p. 252).

[§] See Buchan in Challenger Report: Narrative, vol. i. pp. 998, 999, 1885; also his "Report on Atmospheric Circulation," *Phys. Chem. Chall. Exp.*, part v. pp. 4–8, 1889.

The *annual* range of surface temperature in the ocean within any particular 2° square, so far as recorded, does not exceed 53° Fahr.: this greatest annual range being found off the Banks of Newfoundland in the Atlantic, and in the Japan seas in the Pacific—at places where the surface is occupied by cold waters coming from polar areas at one season, and by warm waters coming from tropical areas at another season; but we shall presently show that there are large areas, both in the tropics and polar regions, where the annual range does not exceed a few degrees during the course of the year. The *extreme* range of temperature recorded in the ocean is about 70° Fahr.: from the freezing-point of salt water in the polar regions to 96° Fahr., recorded at the head of the Persian Gulf.

The much greater range of temperature on the surface of the continents than in the surface and subsurface waters of the ocean, might lead one to expect that the distribution of land organisms would be more limited by temperature conditions than that of marine organisms. Such—at first sight, at all events—does not, however, appear to be the case. It has long been recognized that the mean annual temperature, or the annual range of temperature, in any area on the land surfaces produces a very marked effect on the character of the fauna and flora; still, zoologists have, as a general rule, considered topographical features as the most important factor in limiting the distribution of species, while botanists, on the other hand, have considered temperature conditions as the most important factor. The various zoological provinces, into which naturalists have divided the land-surfaces, have been laid down chiefly from a study of warm-blooded and air-breathing animals, which are able to maintain a nearly uniform temperature of their bodies under great variations in the external temperature conditions. If we except hybernation, there is even a rise in the temperature of the body, and an increase in metabolism in Mammalia, with a lowering of the external temperature. Topographical features, such as mountain ranges, deserts, and seas, seem therefore to be more important factors in determining the limits of distribution of terrestrial species than mere temperature or climatic conditions.

In the ocean there are very few warm-blooded and air-breathing animals, and we have to deal chiefly with cold-blooded animals, the temperature of whose blood rises and falls with that of the surrounding water; hence temperature conditions—even with the lesser variation in range—appear to be, as with plants, the most important factor in limiting the distribution of marine animals. In this connection, the following may be indicated as one of the many interesting problems presented to the naturalist. In the tropics a marine animal—a copepod or isopod, for instance—lives constantly in water at a temperature of about 70° Fahr.; in the polar seas, a similar animal lives as constantly in water at a temperature about zero. What is the difference in the rate of metabolism, length of life, rate of reproduction, and general life-history of the two animals? There seems to be little doubt that a satisfactory reply to these questions would explain many of the observed differences between polar and tropical faunas.

The above and some other allied considerations, together with the desirability of having a more precise knowledge of the variations in the range of temperature in different regions of the ocean, induced me some years ago to attempt the preparation of a map showing the annual range of temperature in the surface waters of the ocean within every two-degree square on the water surface of the globe; for it seemed that a comparison of the range of temperature in different places at the surface of the ocean might possibly show an intimate connection with other oceanographic phenomena.

2. Preparation of the Range-Map from Temperature Observations in Every 2° Square.

A first attempt was made by using the Charts showing the surface temperature of the Atlantic, Indian, and Pacific Oceans, published by the Meteorological Council in 1884. In these charts the mean temperature and range are given for the four different months, February, May, August, and November, as recorded within each 2° square throughout the three oceans; in some localities numerous observations made it possible to give the results within smaller areas. In order to arrive at the extreme annual range within each 2° square, the figures were used in the following manner: Taking the map for February, the maximum and minimum temperatures for any particular 2° square in that month were obtained by adding half the given range to the mean temperature for the maximum, and by subtracting half the given range from the mean for the minimum. This operation was repeated with the maps for May, August, and November, and the four maxima and the four minima were entered on specially ruled paper. The extreme range shown by these four sets of figures was laid down on a blank map as the approximate annual range of surface temperature in each 2° square, and lines were drawn for intervals of 10° Fahr. of range of temperature, in the same manner as the lines on the map accompanying this paper.

A map constructed on this principle was exhibited at a lecture, on the structure, origin, and distribution of coral reefs and islands, delivered before the Royal Institution of Great Britain, in London, on March 16, 1888, with special reference to the range of temperature within the coral-reef regions. On careful consideration this map was not published. The method was rejected as unsatisfactory, because the given mean temperature is not the arithmetical mean between the maximum and minimum temperatures observed in any particular 2° square, but the mean of all the observations, and therefore the maximum brought out by this method may be too high, or the minimum may be too low, according as the great majority of the observations were high or low. For example, in the North-West Atlantic (lat. 42°–44° N., long. 48°–52° W.) a mean temperature of 35° Fahr. is given for the month of February, with a range of 27°; deducting half the range from the mean gives a minimum temperature of 21½° Fahr.—an impossible temperature at the surface of the sea.

Subsequently, an application to the Meteorological Office in London resulted in an arrangement being made, whereby the maximum and minimum surface temperatures for each 2° square throughout the great ocean basins were extracted from the records in that office for the two months likely to give the extremes of temperature, viz. February and August.[*] These maxima and minima were laid down on maps, and the extreme ranges of temperature shown by these figures were placed in geographical position on other maps, lines being drawn enclosing those regions in which

(1) the recorded range does not exceed 5° Fahr.
(2) ,, ,, is between 5° and 10° Fahr.
(3) ,, ,, ,, 10° ,, 15° ,,
(4) ,, ,, ,, 15° ,, 20° ,,
(5) ,, ,, ,, 20° ,, 25° ,,
(6) ,, ,, ,, 25° ,, 30° ,,
(7) ,, ,, ,, 30° ,, 35° ,,
(8) ,, ,, ,, 35° ,, 40° ,,
(9) ,, ,, ,, 40° ,, 45° ,,
(10) ,, ,, ,, 45° ,, 50° ,,
(11) ,, ,, is over 50° Fahr.

In this manner the data supplied by the Meteorological Office, supplemented by information from other sources as indicated in the succeeding paragraphs, have been made use of in preparing the map accompanying this paper, which represents very approximately the annual range of temperature in the surface waters of the ocean throughout the world.

The method adopted in making use of the supplementary information referred to, was to extract the maximum and minimum temperatures recorded in any 1° square throughout the world, and to enter them on sheets of specially ruled paper. Each sheet was ruled so as to contain in convenient form the maxima and minima within a 10° square, the observations being inserted for each 1° square, while the sheet was subdivided by rulings into 2° squares. Thus, at a glance, the range within any 1° square, or any 2° square, or any 10° square, was available. These sheets have been kept up to date by the inclusion of observations from other sources, and, by including all future observations, they can at any time be made available for the revision and correction of the map. On these sheets, maxima and minima collected from every available source have been entered. We may specially mention the observations of surface temperature in the North Pacific, collected together by Admiral Makaroff in his Report on the voyage of the *Vitiaz* in the North Pacific (published in 1894); the observations published annually in the Admiralty Blue-books (Lists of Oceanic Depths and Temperatures received at the Hydrographic Office); and Prof. Mohn's observations of surface temperature in the Norwegian Sea (published in the Report of the Norwegian North Atlantic Expedition).

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[*] The maximum and minimum effects of temperature appear to take place in the water about a month later than in the atmosphere, so that, after consultation with Dr. Buchan, the months of February and August were chosen as the most suitable for our purpose.

I am much indebted to the members of the Meteorological Council, and to the officers of the Department, for the permission and assistance given in consulting the records in their possession.

In 1895 Dr. Schott published a paper on "Die jährliche Temperaturschwankung des Ozeanwassers" in *Petermann's Mitteilungen* (vol. xli. p. 153), and his map is, so far as we are aware, the only attempt to represent graphically the variation of temperature at the surface of the sea, but it has evidently been prepared from *mean* monthly temperatures, and not from extreme temperatures; the range shown on his map is therefore necessarily less than that shown on the map accompanying this paper.

The total number of observations of surface temperature represented by the figures laid down on our charts is very large, and it is very difficult to arrive at even an approximation; but, with the aid of Makaroff's Tables, an attempt has been made to estimate the minimum number of observations in the North Pacific, as set forth, in zones of 10° of latitude, in the following table:—

NUMBER OF OBSERVATIONS OF SURFACE TEMPERATURE IN THE NORTH PACIFIC, AS RECORDED BY MAKAROFF (1894).

Lat. 0° to 10° N.	2,557	observations.
" 10° " 20° "	2,866	"
" 20° " 30° "	4,773	"
" 30° " 40° "	7,722	"
" 40° " 50° "	13,970	"
" 50° " 60° "	5,867	"
" 60° " 70° "	1,085	"
" 70° " 76° "	34	"
Total	38,874	

In the above numbers, those cases where observers have given simply a mean for the twenty-fours have been counted as a single observation, though in reality that mean represents several observations. In addition, there are many cases where the number of observations is not recorded, though a maximum or a minimum temperature, or both, are given; these have been counted as one or two observations, according as one or two readings are given. Therefore the numbers in the preceding table are probably considerably below the truth; but, looking upon them as approximately correct, it appears that the number of observations increases from the equator northwards to between 40° and 50° N., where a maximum of nearly 14,000 observations is reached, from whence the number rapidly decreases northward. Northwards of 70° N. only thirty-four observations had been recorded in 1894, and to the north of 76° no observations were recorded.

But a better idea of the amount of material made use of in preparing the accompanying map will be formed from an examination of the table on p. 120, showing (1) the number of 2° squares in which observations are recorded in the two opposite months of February and August, (2) the number of 2° squares in which observations are recorded in the one or the other of these two months, and (3) the number of squares which are blank as regards observations in these two months, between the latitudes of 60° N. and 60° S. in the three great oceans.

From this table it appears that in the 2° squares, which contain water-surfaces, between lat. 60° N. and 60° S., observations are available in considerably more than half of the total number in the two months specified, while in nearly one-fourth of the total number of squares observations are available in only one of these months, and in the remaining one-fifth there are no observations available. To be more exact, of the total number of squares 56 per cent. contain observations in the two opposite months, 23 per cent. contain observations only in one of these months, and 21 per cent. contain no observations in these two months. A fairer estimate would, perhaps, be obtained by excluding the zone between 50° and 60° S., in which zone, more particularly in the Indian and Atlantic oceans, large tracts are blank. Thus, of the total number of 2° squares between the latitudes of 60° N. and 50° S., 59 per cent. contain observations in the two opposite months, 24 per cent. contain observations in only one of these months, and 17 per cent. contain no observations in these two months.

Considering now the figures relating to each of the great oceans, it appears that of the total number of 2° squares which contain water-surfaces in the Indian ocean between 30° N. and 60° S., 70 per cent. contain observations in the two opposite months, 13 per cent. contain observations in one only of the two months, and 17 per cent. contain no observations in these months. The large amount of information regarding the surface temperature of the Indian ocean is prominently brought out by excluding the zone between 50° and 60° S., which is almost a complete blank; for it appears that of the total number of 2°

Zone of latitude.	Number of 2° squares in which observations of surface temperature are recorded in two opposite seasons.				Number of 2° squares in which observations of surface temperature are recorded in one season only.				Number of 2° squares in which no observations of surface temperature are recorded.			
	Atlantic.	Indian.	Pacific.	Total.	Atlantic.	Indian	Pacific.	Total.	Atlantic.	Indian.	Pacific.	Total.
60° to 50° N.	83	—	180	213	84	—	34	118	6	—	59	65
50° „ 40° N.	154		197	351	26	—	37	63	8	—	23	31
40° „ 30° N	195		151	346	21	—	82	103	7	—	68	75
30° „ 20° N.	174	34	171	379	32	8	94	134	10	5	80	95
20° „ 10° N.	130	110	169	409	42	8	132	182	9	3	105	117
10° „ 0° N.	109	98	156	363	32	29	136	197	4	6	160	170
0° „ 10° S	73	135	78	286	41	47	132	220	20	15	185	220
10° „ 20° S.	78	156	88	322	36	30	157	223	17	16	146	179
20° „ 30° S.	110	163	124	397	22	41	135	198	12	16	87	115
30° „ 40° S.	147	259	231	637	18	4	106	128	5	—	56	61
40° „ 50° S.	105	219	271	625	39	21	110	170	48	5	34	87
50° „ 60° S.	45	2	230	277	4	43	68	115	151	230	126	507
Total ...	1403	1206	1996	4605	397	231	1223	1851	297	296	1129	1722

squares in the Indian ocean, from its northern limits to lat. 50° S., 83 per cent. contain observations in the two months of February and August, 13 per cent. contain observations in one only of these months, while merely 4 per cent. are blank as regards observations in these two months.

Of the total number of 2° squares in the Atlantic ocean between 60° N. and 60° S., 67 per cent. contain observations in the two opposite months, 19 per cent. contain observations in one only of these two months, while 14 per cent. contain no observations in the two months specified. As in the case of the Indian ocean, very few observations of surface temperature are available in the Atlantic south of lat. 50° S. Thus, of the total number of 2° squares in the Atlantic between 60° N. and 50° S., 71 per cent. contain observations in the two opposite months, 21 per cent. contain observations in one only of these months, while merely 8 per cent. are blank as regards observations in these two months.

Of the total number of 2° squares in the Pacific ocean between lat. 60° N. and 60° S., 46 per cent. contain observations in the two opposite months, 28 per cent. contain observations in one only of these months, while 26 per cent. contain no observations in these two months. The zone of latitude from 50° to 60° S. contains relatively many more observations than in the case of the Atlantic and Indian oceans, so that the exclusion of that zone does not alter the proportions in the Pacific to any appreciable extent, the percentages for the Pacific between 60° N. and 50° S. being respectively 45, 29, and 26 as compared with 46, 28, and 26 given above for the Pacific between 60° N. and 60° S.

It will thus be seen that, on the whole, the Pacific basin is the one in which our knowledge of surface temperature is most deficient, and therefore the one in which future observations may be expected to effect the greatest modifications in the map showing the range of temperature. In this ocean the greatest deficiency is within the tropics, the largest number of blank squares occurring between 10° S. and 10° N., from which zone the number of blank squares gradually decreases as far as the 50th parallels north and south; by far the larger proportion of blank squares lie within the six zones between 30° N. and 30° S. On the other hand, in the Atlantic and Indian oceans the number of blank squares is comparatively insignificant, and the blank squares are not grouped together in any particular latitude.

When we consider the recorded temperatures at different seasons of the year towards the arctic and antarctic regions north and south of the 60th parallels, our knowledge is very deficient; still a tolerably correct idea of the range of temperature within the ice-covered seas can be formed, when we remember that the minimum temperature must always be somewhere about 28° Fahr., so that the summer temperatures which have been recorded by explorers may be made use of in arriving at an approximation of the range of temperature. In the southern hemisphere south of the 60th parallel, our maps are almost a complete blank, the observations being limited to those taken in the summer by Ross and other antarctic explorers. In the northern hemisphere, on the other hand, we have a good deal of information. As already stated, Makaroff records numerous observations north of 60° N., extending as far north as 76° N., in the North Pacific, and in the North Atlantic we have been able, approximately, to estimate the range of temperature as far as 82° N., from the observations and maps published by Mohn in the Norwegian North Atlantic Expedition Report, from Koldewey's observations during the German Arctic Expedition, from Nansen's published observations, and from records brought home by Mr. Bruce, of the Jackson-Harmsworth Expedition, as well as other arctic explorers. From these sources we have observations in no less than 155 squares between lat. 60° and 82° N., and long. 26° W. and 38° E., which are available in estimating the range of temperature.

3. General Features of the Map.

The lines on the map are drawn for intervals of 5° Fahr. of range of temperature, and different shades of colour are used for intervals of 10° Fahr. Broadly speaking, the map shows that the surface of the ocean may be divided into five great zones: firstly, a circumtropical zone with high temperature and small range (coloured deep red on the map); secondly, two circumpolar zones with low temperature and small range (coloured pale red on the map); and lastly, two intermediate zones with large ranges lying between the circumtropical and the two circumpolar zones (coloured in different shades of blue on the map).

The regions indicated as having a range of less than 5° Fahr. are largely hypothetical, more especially in the polar regions and tropical Pacific, though the small areas laid down in the tropical Atlantic and tropical Indian oceans are based upon numerous observations. In the polar regions the line coincides approximately with the line of perpetual ice.

The northern circumpolar band, with a range not exceeding 10° Fahr., borders the northern shores of Asia and America, lying mostly within the arctic circle. It is probable, however, that a wider range will be found off the mouths of many of the rivers flowing into the Arctic ocean from America and the Eurasian continent. The corresponding southern circumpolar band apparently approaches nearer to the tropics, extending northwards, approximately, as far as lat. 50° S., and penetrating to the north of that latitude in the Atlantic, but it may be expected that more extended observations will necessitate the drawing of the line of 10° range much nearer the antarctic circle, probably throughout its whole extent. In these two circumpolar bands, with a range of less than 10° Fahr., observations are meagre, and indicate a range from about 28° to about 50° Fahr., though not exceeding 10° Fahr. in any single 2° square.

The tropical band of small range (less than 10° Fahr.) marks out approximately the coral-reef regions of the world. It forms an almost continuous belt around the globe, being broken only by the interposition of the continental masses, and for a short distance in the Pacific, off the shores of Central America. Future observations may show it to be completely broken also off the western coast of Africa, where it is now shown as continuous across the whole Atlantic. The Pacific area is the largest, stretching from near the Central American coast across to the East Indian seas and Barrier Reef of Australia (and passing through the Arafura sea into the Indian ocean), confined almost entirely within the tropics of Cancer and Capricorn, but extending beyond the latter tropic in the Central South Pacific. The observations within this Pacific tropical area show a range from 70° to 90° Fahr., though not exceeding 10° Fahr. in any single 2° square; throughout the area, however, a great many of the squares are blank, and future observations may alter the form considerably.

In the Indian ocean a belt of small range (less than 10° Fahr.) stretches across from the east coast of Africa (south of Cape Guardafui and north of Madagascar) to the shores of the Malay peninsula and Sumatra (and passing through the Arafura sea into the Pacific), lying mostly to the north of lat. 10° S., and filling up the greater part of the Arabian sea and of the Bay of Bengal. The observations within this Indian ocean tropical area show a range from 72° to 87° Fahr.

In the Atlantic the belt of small range (less than 10° Fahr.) extends across from the Caribbean sea and the north-east coast of South America to the Liberian coast of Africa, reaching northward in the central part of the ocean to the northern tropic, and southward to a little beyond lat. 20° S. The observations within this Atlantic tropical area show a range from 72° to 85° Fahr. It includes three squares, in which the recorded range just reaches 10° Fahr., all on the parallel of 10° N.

If we now turn our attention to those portions of the map which are coloured blue, where the range exceeds 10° Fahr., it will be observed that the area with a range of temperature between 10° and 20° Fahr. (indicated by the palest shade of blue) is the most extensive on the surface of the ocean. It fills up the intervals between the three bands of small range just described, and encloses in certain positions areas having a greater range. The line of 15° range cuts this pale blue area into two parts, and it will be observed that the area with an annual range exceeding 15° Fahr. lies mostly in the temperate regions between the tropics and the polar circles. The area does not reach the antarctic circle in the south, but it penetrates considerably beyond the arctic circle in the North Atlantic, extending north of the island of Jan Mayen, and in Bering strait it extends just beyond the arctic circle. In the southern hemisphere it forms a band broken only in the centre of the South Pacific, where, however, observations are scarce, so that it may ultimately prove to be a continuous girdle round the globe.

A band with a range of over 20° Fahr. occurs in the southern hemisphere entirely south of the tropics, continuous across the South Atlantic and across the greater part of the South Indian ocean; in addition, there is an area off the south-east of Australia enclosing Tasmania, an area entirely encircling New Zealand, four small areas off the west coast of South America between lat. 10° and 50° S., and a small area off the west coast of Africa, northward of Cape Frio.

In the northern portion of the Indian ocean a range of over 20° Fahr. is found only off Cape Guardafui, extending into the Red sea, where the temperature varies from 59° to 94° Fahr., and in the Persian gulf and entrance thereto, where the temperature varies from 58° to 96° Fahr.

A large part of the North Atlantic has a range of over 20° Fahr., extending across from the Gulf of Mexico and the eastern shores of North America to the western shores of Europe and Africa, and into the Mediterranean. The eastern boundary of this area stretches from lat. 10° N., on the coast of Africa, to lat. 70° N., near the North Cape on the Norwegian coast.

In the North Pacific an extensive area, with a range of over 20° Fahr., extends across from the eastern shores of Asia to the west coast of North America, and into the Bering sea, where it reaches as far northward as lat. 64° N. There is also a small area in the region of the Gulf of California, with a range exceeding 20°, a range of 27° being recorded in the upper half of that gulf.

A range exceeding 25° Fahr. is found in various parts of the ocean, almost entirely outside the tropics, the only positions within the tropics being off Cape Guardafui and in the Red sea, and off the Chinese coast. In the North Atlantic an extensive area lies off the east coast of North America, between lat. 30° and 50° N., extending seawards beyond long. 30° W.; a second area fills the Mediterranean and Black sea; and a third area occurs in the Irish sea, English channel, North sea, Baltic sea, running up the Norwegian coast to 70° N. In the North Pacific a large area lies off the Asiatic coast, between lat. 16° and 58° N., extending seawards to near long. 170° E., with a small isolated area in the central part of the ocean, between lat. 45° and 50° N., and another in the upper half of the Gulf of California (as already indicated). In the Indian ocean a range exceeding 25° has been recorded off Cape Guardafui, in the Red sea, and Persian gulf.

In the southern hemisphere, a considerable area, with a range of over 25°, lies off the east coast of South America, between lat. 24° and 44° S., extending seawards off the mouth of the Rio de la Plata as far as long. 44° W., with a small isolated patch in the centre of the South Atlantic, about lat. 30° S. Another considerable area lies off the Cape of Good

Hope, extending southwards as far as lat. 46° S., and eastwards on either side of the 40th parallel as far as long. 72° E. An isolated patch occurs to the south of Tasmania, and a larger area off the Sydney coast of Australia.

Considering now those regions of the ocean where a known range of surface temperature exceeding 30° Fahr. occurs, the map shows three small areas in the southern hemisphere, one off the mouth of the Rio de la Plata, and the other two south of the Cape and Madagascar; and in the northern hemisphere two extensive areas, one in the North-West Pacific, the other in the North-West Atlantic; and smaller areas in the Mediterranean and Black sea, in the Baltic, North sea, and English channel, and at the heads of the Red sea and Persian gulf (as already indicated).

In the area off the mouth of the Rio de la Plata the greatest range shown in a single square is 33° (from 42° to 75°), the extreme range within the area being from 40° to 78° Fahr.

In the area laid down to the south of the Cape of Good Hope, the figures supplied by the Meteorological Office show a range of 29° (from 46° to 75° Fahr.) in two different squares, on either side of a square with a range of 28° (45° to 73° Fahr.), surrounded on all sides by squares with ranges of 27° and 26° Fahr., but other records from the same region indicate a range of over 30° Fahr.

In the area in the Southern Indian ocean, south of Madagascar, two adjacent squares show a recorded range of 32° Fahr. (in one case 40° to 72°, in the other 42° to 74°). The temperature within the area ranges from 36° to 74° Fahr.*

The area in the North-West Pacific with a range exceeding 30° lies off the east coast of Asia, between lat. 22° and 56° N., and the observations within the area show a range from 29·8° to 86° Fahr.

The largest area in the North Atlantic basin with a range exceeding 30° lies off the east coast of North America, between lat. 30° and 50° N.; a second area covers the greater part of the Mediterranean and Black sea; and a third small area occurs in the English channel and south-eastern part of the North sea, extending into the Baltic.

At the head of the Red sea ranges of 36° (from 57° to 93°) and of 38° (from 50° to 88°) are recorded, and at the head of the Persian gulf a range of 31° (from 65° to 96°).

A range exceeding 35° Fahr. occurs at the head of the Red Sea, in the eastern Mediterranean, in the north-western part of the Black sea, with large areas in the North-West Atlantic and the North-West Pacific, but there is apparently no region in the southern hemisphere where the records show a range as great as 35° Fahr.

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* Off the east coast of Australia, near Sydney, the records show a range in one square of 28° (from 57° to 85°), and in another square of 26° (from 54° to 80°); but future observations may prove that in this locality the range is over 30°.

A range of surface temperature exceeding 40° Fahr. occurs in the north-western portions of the Atlantic and Pacific oceans, in which positions the greatest range in the surface waters of the globe is found. The observations within the North Atlantic area show a range from 26° to 83°, and within the North Pacific area from 28·8° to 88°. There are indications that in the eastern part of the Mediterranean, near the island of Cyprus, the surface waters have also a range exceeding 40°, while in the north-western part of the Black sea a similar large range occurs.

A range exceeding 45° Fahr. occurs only in the North-West Atlantic and North-West Pacific, each enclosing an area having a range of more than 50° Fahr.

A range of surface temperature exceeding 50° Fahr. is found only in the North-West Atlantic and North-West Pacific. The North Atlantic area is much the larger, extending off the North American coast, to the south of Nova Scotia, seaward to near long. 50° W. The greatest recorded range in a single square is 52° (from 28° to 80°), while the extreme range within the area is from 27° to 83°. The North Pacific area lies off the coast of Asia in the Sea of Japan, in about the same latitude as the Atlantic area (40° N.). The greatest recorded range in a single square is 52·7° (from 28·8° to 81·5°), and the extreme range within the area is from 28·8° to 83·7° Fahr.

From the foregoing discussion it will be seen that the lowest recorded temperature-reading at the surface of the sea is 26° Fahr. in the North Atlantic, eastward of Nova Scotia, and the highest reading in the open ocean is 90° Fahr., recorded in the tropical Pacific both north and south of the equator, though readings of 94° and 96° Fahr. are recorded in the Red sea and Persian gulf respectively. The greatest known range of temperature of the surface waters throughout the whole world is thus 70° Fahr. (from 26° to 96°).*

4. RELATION OF RANGE OF TEMPERATURE TO SOME OTHER PHYSICAL PHENOMENA.

Range of temperature has a very important effect in bringing about a vertical circulation in ocean waters. In the equatorial regions, where there is hardly any variation of surface temperature, the warm water remains at the surface, and there relatively cold water comes nearer to the surface than in those regions in temperate zones where there is a wider daily and annual range. The cooling of the surface layers at night and during winter in temperate regions causes the salter waters of the surface to sink through the underlying layers, carrying with them heat and atmospheric gases to the greater depths. The effect of freezing in the polar regions is in the end similar to that of evaporation in warmer latitudes. The lighter ice is separated from the denser mother-liquor, which sinks to the greater depths, leaving the ice on the surface.

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* The colours indicated on the map for the bodies of fresh water (such as the North American and Siberian lakes) have been laid down from a study of all accessible information.

These statements as to the effects of range of temperature might be illustrated by reference to many parts of the ocean. It will be sufficient to refer to the most striking example, in the southern hemisphere, where there is a band of large range of temperature right round the world. The warm tropical waters, which are driven southwards along the eastern coasts of South America, Africa, and Australia, into the Great Southern Ocean, there become cooled as they flow to the east before the strong westerly winds. On account of their high salinity, these tropical waters can suffer much dilution with antarctic water, and still be denser than water from these higher latitudes at the same temperature. Here the density observations and the seawater gases indicate that a large part of the cold water found at the greater depths of the ocean probably leaves the surface, and sinks towards the bottom of the Southern Ocean, between the latitudes of 45° and 56° S.

At a depth of 100 fathoms, the temperature in one part of the ocean may differ from that to be found in some other part at the same depth by as much as 42° Fahr.; and at 500 fathoms there may be between one part and another a range of as much as 20° Fahr.; at 1000 fathoms, a range not exceeding 11° Fahr.; and at 1500 fathoms, not exceeding 8° Fahr. A consideration, however, of all the available observations shows that there is no evidence of any annual variation of temperature at any one spot in the ocean at a depth of 100 fathoms; and at a depth of 50 fathoms no annual range greater than 2° Fahr. appears to be indicated. This remark applies especially to the open ocean; but, although we have no direct observations, still it is most probable that along certain coasts a wide range of temperature is occasionally produced at the bottom in depths of 50 and even 100 fathoms, due to the lateral shifting of large bodies of water from different sources. The evidence of movements like these comes especially from regions where polar and equatorial currents meet, or run alongside of each other in different directions, as, for instance, in the case of the Gulf Stream and Labrador current off the eastern coasts of North America,* to which reference will presently be made in connection with the destruction of the tile-fish. Those areas, where currents of different temperatures meet, correspond with the areas of greatest annual range, indicated on the map by the deepest shades of blue, and they become the theatre of some remarkable phenomena, specially interesting to the biologist and geologist.

If a comparison be made between the map accompanying this paper and the maps showing the isobaric lines and prevailing winds for

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* W. Libbey, Junr., "The Relations of the Gulf Stream and the Labrador Current," Report Sixth Intern. Geogr. Congress, London, 1895.

January and July, published in the 'Challenger Report' by Dr. Buchan, it will be seen that there is a general parallelism between the regions marked off by the blue colours and the position of the anticyclonic areas of the ocean. In these intermediate regions, between the equatorial band and the two circumpolar bands of small range, there is probably at all times of the year more insolation, or sunshine, and consequently a greater absence of clouds, than is to be met with in the tropical or polar areas, which may account to some extent for the wide range. It will be noticed that the deepest shades of blue are situated on the polar sides of the anticyclonic areas, and in these positions the greatest cyclonic disturbances are met with; in these regions the strength and direction of the winds and currents vary at different times of the year, owing to the position of the sun in the months of January and July. Currents from widely separated sources are in this way frequently carried over the same position even in the open ocean.

A large range of temperature, due to upwelling, as a result of the action of the winds, is indicated by the blue colours along the west coasts of Africa and South America, and on the east coast of Africa, near Cape Guardafui. The relatively wide range represented by the blue colour which extends from the Gulf of Guinea to the westwards about the equator, and a similar arrangement at the equator off the Gulf of Panama, seem to be due to currents variable in speed but constant in direction, producing greater upwelling at one season than at another, but in currents which are relatively constant in direction and speed a small range of temperature usually occurs.

It is to be noted that in the tropical regions the lines showing the variation spread outwards in the shape of a fan towards the eastern shores of the continents, whereas, on the other hand, in the northern and southern temperate regions they show a tendency to spread out in like manner towards the western shores of the continents; this is especially the case in the Atlantic. This position of the lines is what would be expected from a consideration of the general system of winds and oceanic circulation.

5. Relation of Range of Temperature to Biological Phenomena.

Where cold and warm currents meet at the surface of the ocean there is a rise of temperature for the animals of the cold current, and a fall of temperature for the animals of the warm current, which results in a plentiful destruction of organisms. The tow-net collections during the *Challenger* expedition gave frequent illustrations of this fact by the dead animals collected in such positions off the coast of North America, off the Cape of Good Hope, in the North Pacific, and elsewhere. Dr. O. Fischer records a remarkably large number of bacteria on the borders of such meeting currents. This destruction of life is not limited to minute pelagic organisms, but occasionally affects animals which live at the bottom of the sea. Some remarkable instances of this kind have been observed between depths of 50 and 100 fathoms off the eastern coast of the United States.

Lieut.-Commander Tanner, commanding the United States Fish Commission steamer *Albatross*, reports that "on the morning of July 20, 1884, in lat. 37° 47′ N., long. 74° 15′ W., near the 100-fathom line, we passed numerous dead octopods floating on the surface. This unusual sight attracted immediate notice and no little surprise among those who knew their habits, as it was not suspected at first that they were dead. We lowered a boat and picked up three or four specimens, which we were unable to identify, but in general appearance they resembled *Alloposus mollis* (Verrill) of unusually large size. These dead cephalopods were seen frequently on the 100-fathom line and outside of it, from the position given above to the meridian of Montauk point, a distance of 180 miles. They were less numerous, however, as we went to the northward and eastward. Several dead squid were seen also, and two specimens were picked up with a scoop-net."[*]

A still more remarkable instance of this kind is furnished in the well-known case of the destruction of the tile-fish in the same locality in the spring of 1882.[†] In the months of March and April, 1882, vessels arriving at Philadelphia, New York, and Boston reported having passed large numbers of dead or dying fish scattered over an area of many miles, and from descriptions and the occasional specimens brought in, it was evident that the great majority of these were tile-fish. Naturally, these fish were not evenly distributed over all the area in which they were seen, some observers reporting them as scattering, and others as at times so numerous that there would be as many as fifty on the space of a rod square. As one account after another came in, it became apparent that a vast destruction of fish had taken place, for vessels reported having sailed for 40, 50, and 60 miles through floating fish; and, in one case, the schooner *Navarino* sailed for about 150 miles through waters dotted as far as the eye could reach with dying fishes. Computations made by Captain J. W. Collins seem to indicate that an area of from 5000 to 7500 square statute miles was so thickly covered with dead or dying fish that their numbers must have exceeded the enormous number of one billion. Since there were no signs of any disease, and no parasites found on the fish brought in for examination, their death could not have been brought about by either of these causes; and many conjectures were made as to the reason of this wholesale destruction of deep-water fishes, such as would ordinarily be unaffected by conditions prevailing at the surface, submarine volcanoes, heat, cold, and poisonous gases being variously brought forward to account for the loss of life. Prof. Verrill has noted the occurrence of a strip of water, having a temperature of 48° to 50° Fahr., lying on the border of the Gulf Stream slope, sandwiched between the arctic current on the one hand and the cold depths of the sea on the other. During 1880 and 1881, Prof. Verrill dredged along the Gulf Stream slope, obtaining in this warm belt, as he terms it, many species of invertebrates characteristic of more southern localities. In 1882 the same species were scarce, or totally absent from places where they had previously been abundant; and this, taken in connection with the occurrence of heavy northerly gales and the presence of much inshore ice at the north, leaves little doubt that some unusual lowering of temperature in the warm belt brought immediate death to many of its inhabitants. This is the more probable, as it is a well-known fact that sudden increase of cold will bring many fish to the surface in a benumbed or dying condition, and there are no indications of any shock or earthquake having occurred at the time the dead fish were first noticed.

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[*] 'Report of the Commissioner for 1884,' p. 32.

[†] This account is taken from Goode and Bean, 'Oceanic Ichthyology' (*Mem. Mus. Comp. Zoöl.*, vol. xxii. pp. 287, 288).

It has been estimated that the bottom of the ocean in this region must at the time have been covered to the depth of about six feet with the dead bodies of the tile-fish and other marine organisms, and it seems evident, from the subsequent researches of Prof. Libbey, that their destruction was due to the lateral shifting of currents from different sources and of different temperatures, thus producing a wide range of temperature even at depths of 50 and 100 fathoms.

An indirect effect of the range of temperature, and of the destruction of organisms like those above described, can be recognized in the deposits on the floor of the ocean. It is a rather remarkable circumstance that all the places where the *Challenger* discovered a great development of glauconite and phosphatic nodules in the deposits are intimately associated with a wide annual range of temperature at the surface of the ocean—as, for instance, off the eastern coasts of the United States, off the Cape of Good Hope, and off the east coasts of Australia and Japan. The *Blake* and the *Albatross* have dredged from the area where the tile-fish was destroyed, and in the Florida straits, some very large brown-coloured phosphatic nodules weighing many pounds in weight.* These concretions were made up of the remains of pelagic Foraminifera and the other materials composing the deposits, in depths of 200 and 300 fathoms, and contained 23·53 per cent. of phosphoric acid, and 52·15 per cent. of lime. In one of these nodules there were embedded two Lamna teeth, similar to those dredged in large numbers from the greater depths of the Pacific. It is, however, interesting to note that in the shark's teeth embedded in these phosphatic nodules the cartilaginous base is preserved, as in the specimens from the Tertiary deposits and elsewhere, while in the specimens from the deep sea this base is never present; only the hard shell of dentine remains.*

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* Agassiz, 'Three Cruises of the *Blake*,' vol. i. pp. 275–276 (*Bull. Mus. Comp. Zoöl.*, vol. xiv.). 1888.

The long lines of phosphatic nodules which occur, for instance, in the calcareous Miocene and Oligocene beds of the island of Malta † thus possibly indicate the occasional destruction of a large amount of animal life in the surface waters of the Tertiary ocean, owing to changes of temperature, although it might also be due to changes of salinity and other causes.

On the Agulhas bank, the *Challenger* and the *Gazelle* met with very characteristic glauconite deposits in depths between 100 and 150 fathoms, and the phosphatic nodules in these deposits were of a dark-green colour. An analysis of the *Challenger* material gave 19·96 per cent. of phosphoric acid, and 39·41 per cent. of lime; and an analysis of the *Gazelle* material gave 38·88 per cent. of phosphate of lime. In the same region the *Challenger* dredged similar nodules of a lighter colour in 1900 fathoms. It is probable that the phosphate in these nodules was ultimately derived from the fish and other animals killed at the surface, and in shallow depths, by sudden changes in the temperature conditions, this being one of the areas of wide range indicated on the accompanying map.

Still another effect produced in the deposits by sudden changes of temperature at the surface is that the deposits of Globigerina Ooze appear to be much purer beneath those areas where currents from different sources meet at the surface, especially far from coasts. This, in all probability, arises from the more abundant destruction of these pelagic Foraminifera in such situations than in other areas with a more constant temperature. The rain of the carbonate of lime shells would be more rapid and constant, and consequently they would bulk more largely in the formation of the deposit compared with the inorganic materials which are usually present. In this way there may possibly be a more rapid formation of deposits beneath areas with a large annual range than at other places.

It has already been stated that the circum-equatorial zone, with a high temperature and small range, includes the typical coral-reef regions of the world. In the tropical surface waters there is a great development of organisms which secrete carbonate of lime, such as pelagic molluscs and Foraminifera, coccospheres and rhabdospheres, and in the shallow depths around the shores organisms with massive carbonate of lime shells and skeletons are abundant, such as corals, decapod crustaceans, and a great variety of molluscs and calcareous algæ. As we proceed to the colder waters of the north and south the organisms

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[*] Murray, "Report on the *Blake* Deposits" (*Bull. Mus. Comp. Zoöl*, vol. xii. p. 42). 1885.

[†] Murray, "The Maltese Islands, with Special Reference to their Geological Structure" (*Scott. Geogr. Mag.*, vol. vi. p. 449). 1890.

with massive shells gradually disappear, or are represented by small dwarfed species. In the cold polar waters the predominant animals belong to the hydroida, holothurioidea, annelida, amphipoda, isopoda, and tunicata, in which there is a feeble development of carbonate of lime.

The secretion by calcareous organisms of the practically insoluble carbonate of lime from the soluble sulphate of lime in sea-water can scarcely be regarded as wholly a direct life process, in so far as it is capable of proof that the reaction results from the decomposition of the calcium sulphate by ammonium or methylamine carbonate, secreted by these organisms in place of urea, as in the Mammalia. Of course, in lime-secreting animals the metabolism gives rise to the formation of either ammonium or methylamine carbonate, or other nitrogenous bodies which quickly decompose and yield ammonium carbonate. It is the waste or effete products of the animal itself which become the sole factor in the building up of the structures known as coral and shell. This point has been satisfactorily investigated by the experiments made by Murray and Irvine at the Granton Marine Station. With regard to the condition of the carbonate of lime so formed, it is an interesting and important fact that it is modified in an extraordinary degree by differences of temperature. For example, if, in imitation of nature, we add to sea-water neutral ammonium or methylamine carbonate in the proportion which will decompose the calcium sulphate present, and expose one portion of the mixture to a temperature of 80° Fahr., so as to represent the heat of equatorial waters, and expose another portion of the mixture to a temperature of 45° Fahr., so as to represent the cold zones of the sea, we find that in the warm water the separation of carbonate of lime begins almost at once, and takes the aragonitic form, whereas in the cold water it begins only after the lapse of a few hours, and is precipitated as well-defined rhombohedral crystals, similar to crystals of calcspar, so that in eight hours the amount of carbonate of lime thrown out of solution in the warm water is about twelve times that in the cold water. When we take into account the increased metabolism of organisms living in water at a temperature of 80° to 90° Fahr., as against the decreased metabolism of those living in colder waters, the abundant secretion of carbonate of lime which takes place in tropical waters, as compared with that in the cold waters of the arctic and antarctic regions, is readily explained. Another interesting circumstance is the greater solubility of lime and some of its salts in cold than in hot water, which fact assists in explaining the increase of calcareous deposition in warm seas over that known to take place in colder regions.*

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* Murray and Irvine, "On Coral Reefs and other Carbonate of Lime Formations in Modern Seas" (*Proc. Roy. Soc. Edin.*, vol. xvii. pp. 79–109), 1890.

In those areas where the ocean is occupied by a warm current at one season, and by a cold current at another season, a periodicity can be observed in the deposition of the carbonate of lime in the shells and other calcareous structures of marine organisms, as well as in reproduction. On the other hand, in the polar and equatorial zones, where there is a small range of temperature, periodicity in the deposition of carbonate of lime, or in reproduction, is absent or difficult to recognize.

This comparative absence of massive carbonate of lime shells and corals in the polar waters, when compared with the abundance of these lime-secreting organisms in tropical waters, produces a general resemblance between the marine faunas and floras of the north polar and south polar regions, which is very striking, although this resemblance might have been anticipated from the similarity in the physical conditions, which, with reference to temperature range, is shown on the accompanying map. The resemblance here referred to in the animals of the two polar areas extends frequently to cases of specific and generic identity, the species and genera not now being found in the intermediate tropical area.

In the year 1841, Sir James Clark Ross dredged off the antarctic continent species of animals which he recognized as the same as he had been in the habit of dredging in equally high northern latitudes, and he suggested that they might have passed from one pole to the other by way of the cold water of the deep sea.

When the *Challenger* first reached the great southern ocean, the naturalists of the expedition were much struck with the general likeness of a large number of the organisms captured in the tow nets and trawls to those found on the coasts of Europe and North America. In the reports containing the detailed descriptions of species, the specialists frequently call attention to identical, or nearly identical, species from high southern and high northern latitudes, which appear to be entirely unrepresented in the intervening tropical zones. In many cases, for instance, they have been unable to detect any important differences between specimens from Kerguelen and the coasts of Great Britain, although, from purely geographical considerations, they have given a new specific name to the southern specimens.*

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* Thus Stebbing describes a new species from the Southern ocean (*Amphilochus marionis*) which has a great resemblance to *Amphilochus tenuimanus* of European seas, remarking that "altogether the sum of the differences, added to the great distance between the localities at which the specimens occur, makes it unsafe to place the northern and southern examples in one and the same species" (*Zool. Chall. Exp.*, pt. 67, p. 746). Again, Smith describes a new species from the Kerguelen region (*Thracia meridionalis*), which, he says, "is the southern representative of the Greenlandic species, *Thracia truncata*, and, indeed, differs so slightly from it that it is with considerable hesitation I venture to describe it as distinct, being mainly influenced to do so by the difference of locality" (*Zool. Chall. Exp.*, pt. 35, p. 69).

Ortmann, speaking of the Decapod Crustacea, says: "Nach dem Stande unserer jetzigen Kenntniss ist *Keine einzige bipolare Art bekannt*" (Ortmann, *Zoologischen*

Dr. Günther says the most striking character in the distribution of the shore-fishes of the southern temperate zone is the reappearance of types inhabiting the corresponding latitudes of the northern hemisphere, and not found in the intervening tropical zone. This interruption of the continuity in the geographical distribution of shore-fishes is exemplified by species as well as genera; for instance, *Chimæra monstrosa*, *Galeus canis*, *Acanthias vulgaris*, *Acanthias blainvillii*, *Rhina squatina*, *Zeus faber*, *Lophius piscatorius*, *Centriscus scolopax*, *Engraulis encrasicholus*, *Clupea sprattus*, *Conger vulgaris*. Instances of genera are still more numerous: *Cestracion*, *Spinax*, *Pristiophorus*, *Raja*; *Callianthias*, *Polyprion*, *Histiopterus*, *Cantharus*, *Box*, *Girella*, *Pagellus*, *Chilodactylus*, *Sebastes*, *Aploactis*, *Agonus*, *Lepidopus*, *Cyttus*, *Psychrolutidæ*, *Notacanthus*; *Lycodes*, *Merluccius*, *Lotella*, *Phycis*, *Motella*; *Aulopus*; *Urocampus*, *Solenognathus*; *Myxine*.

Many hypotheses have been advanced to account for this bipolarity in the distribution of marine organisms, and altogether the subject is a most interesting one, which will be discussed with greater detail in another communication.

Before the reading of the paper, the PRESIDENT said: I have to welcome here again Dr. John Murray. I may as well mention that the Royal Society last week had a very important meeting, when Dr. Murray read another most interesting paper on the Importance of the Results of Antarctic Exploration, and it was followed by a discussion of great importance and considerable weight, judging from the positions of those who took part in it, and which I believe and hope will have some effect on public opinion. I am sure the meeting will also welcome very heartily the presence this evening of a gallant companion of Dr. Nansen, Lieut. Johansen. He is only here for a few days amongst us, and we are delighted to see him.

After the reading of the paper, the following discussion took place:—

Admiral Sir WM. WHARTON: I suppose the President has called upon me because I have to do with the sea; but my line of investigation is very considerably different from that of Dr. Murray. What Dr. Murray does he does very well,

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Jahrbüchern, Abth. f. Syst., etc., Bd. ix. p. 585, 1896). Henderson, in his report on the *Challenger* Anomura, in describing *Lithodes murrayi* from the Kerguelen region, says it "is apparently most closely allied to *Lithodes maia*" (from the North Atlantic), "but the latter species is of large size, and the spines on the carapace are more numerous and more uniformly equal in size" (Henderson, *Zool. Chall. Exp.*, pt. 69, p. 44). Henderson writes me that these very slight differences were the only ones he could detect, and it seems evident that had the two specimens been taken from the same haul of the trawl, or from the same locality, they would never have been erected into two distinct species. Henderson writes me further that throughout the entire range of Crustacea there is no better illustration of bipolarity than that furnished by the Lithodidæ. *See* Chun, 'Die Beziehungen zwischen dem arktischen und antarktischen Plankton.' Stuttgart: 1897. Ortmann, 'Grundzüge der marinen Tiergeographie.' Jena: 1896. Pfeffer, 'Die niedere Thierwelt des antarktischen Ufergebietes,' Die Deutschen Expeditionen und ihre Ergebnisse (Die International Polarforschung), Bd. ii. p. 455. Berlin: 1890. Murray, *Summary of Results Chall. Exp*, p. 1459, 1894.

and he has given us a most admirable lecture to-night. He has certainly enlarged my ideas very much on the effect of the changes of temperature in the water. He has done what has not been done before—constructed this map from extreme ranges. It has been taken in some cases from a small number of observations, but probably represents the main facts. He has shown us what a great effect these changes of temperature may have on life, and he has referred also to the great effect it has on meteorological conditions—the formation of cyclones. It has been well known for a long time that the great birthplace of gales are those areas that he has pointed out, where the changes of temperature are the greatest. I am not at all prepared to follow him in his speculations as to how the animals who live in the arctic and antarctic regions have managed to change their localities; but I think he has given us very good proof that the animals are practically identical, and the question of how that has come about, I suppose, will not be solved quite yet. It is a matter for further investigation. I do not think I shall add anything to your knowledge if I say anything more.

Dr. Buchan: In this communication Dr. Murray has made a notable advance in oceanography. Several attempts have been previously made to show the range of the surface temperature of the ocean. But all these attempts have been simply to represent the difference in temperature between February and August, the coldest and warmest months respectively. It is, however, evident that such a range-temperature map of the surface waters of the oceans of the globe is singularly defective in showing the influence of temperature-changes on the living creatures with which the ocean everywhere teems. To do this it is altogether essential to reveal the absolute extremes of temperature to which these living creatures are exposed in the course of years. This is the problem which Dr. Murray has for years resolutely faced, and the map now hanging on the wall is the outcome of this great undertaking. It shows the difference between the absolutely highest and the absolutely lowest temperatures hitherto observed in each 2° square of the ocean, and the Royal Geographical Society is to be congratulated as being the medium of communicating this important investigation to the scientific world, which has been successfully carried out at no inconsiderable labour, time, and expense.

Mr. W. Leighton Jordan: What we have just heard from Dr. Murray evidently forms an admirable basis for a general discussion on the subject, and that has never yet been held since the *Challenger* returned, so I would suggest that the meeting be adjourned; we need not necessarily meet here, but I move that the meeting be adjourned in order that the discussion may be continued. It is too late now to have the discussion.

Dr. Murray: I should not be able to be present; I shall have to return to Scotland within two days.

Mr. Leighton Jordan: I am afraid it is rather late to start a discussion now—ten o'clock.

Dr. Mill: My only claim to speak is that, of all those in this audience, I am, perhaps, the one who has most enjoyed to-night's meeting. I have been associated with Dr. Murray for several years in practical oceanographical work, and it has been a wonder to me to see the way in which he has been able to fix upon those facts that were capable of the widest possible application, and to pass by others that were merely local. In his paper to-night he has brought up a wealth of material suitable for discussion, but unfortunately there are very few—in fact, I feel there is no one—fully capable of discussing this question at the present time except Dr. Murray himself. That is one of the reasons why it is so desirable that we should have some more information, such as a new oceanographical expedition would collect. Then other people would have an opportunity of knowing something, and possibly of challenging Dr. Murray's opinions in consequence of the acquisition of fresh data.

Mr. **George Murray**: I can amply confirm the conclusion that Dr. Murray has arrived at with regard to bipolarity of organisms so far as they are concerned with the flora, both the littoral flora (those organisms that we call seaweeds) and also those that live far away from land. There is no doubt this bipolarity is especially striking in these organisms that live far away from land. Quite recently, however, with the help of Miss Barton, I made a minute examination of all the known littoral seaweeds in the arctic and antarctic regions, and we found a very high percentage of species in common; but this, however, is nothing to the community of *type* that exists among those minute organisms that live in the ocean. For example, the polar regions north and south are inhabited characteristically in the open ocean by diatoms, the temperate seas by Peridinieæ and coccospheres, and the tropics by Peridinieæ, coccospheres, rhabdospheres, and other forms. Now, I had my conclusions (which were very likely somewhat cut and dry) a little upset last summer. You know the diatoms are characteristic of the polar sea, and find their finest development there, but yet they are always more abundant near land than they are in the open ocean; in fact, by the use of a tow-net and a microscope, you would know almost as well as with a Thomson sounder when you are coming near land by the increase of the diatoms you get in your tow-net. I found in a traverse of the Atlantic that I made last summer, and from observations made for me for a whole year between the Channel and the Caribbean sea by officers of the Royal Mail Steam Packet Company—I found from those observations that there were very few diatoms as soon as we got away from land, but when we got close to Barbados we got more, and rather more again in the Caribbean sea, and when we got to Panama we got an extraordinary number. The diatoms are abundant in Colon bay from August to February, from the two extremes of temperature (there is very little range of temperature there—from 81° to 83°), and I venture to say they are quite as abundant there as they are in the arctic regions, or as they are in Loch Fyne, which, I believe, holds the record for diatoms in the number to the cubic inch, if I may put it that way. I should like to get an explanation from Dr. Murray; I should like to know whether temperature alone has much to do with this. It is quite true that in a place like Colon bay we have a very stable temperature, just as in the arctic and antarctic we have a very stable temperature. I must say the species we found in Colon bay were inseparable from the species we found in Loch Fyne. I should like to know whether the chemical constitution of the water has not something to do with this. One is rather apt to suspect this from the fact that diatoms are so abundant near land. I should like to know if these other factors have not something to do with this question of distribution, I mean besides temperature. I do not yield even to Dr. Mill in my estimate of the value of the facts brought before us by Dr. Murray; but I do plead for other factors besides temperature being taken into consideration, especially in dealing with such highly complex things as living organisms.

Dr. **Gregory**: I am glad of the opportunity as a biologist of expressing gratitude to Dr. Murray for this brilliantly original and suggestive paper, for it is on the researches of physicists that the biologists must rely for the explanation of the riddles of biological distribution. There are many points in the paper, I think, that will help biologists to explain some of those difficulties. During the last few years there has been a strong tendency to attribute all deposition of carbonate of lime from the sea to the direct action of life, but Dr. Murray's experiment of the precipitation of carbonate of lime from sea-water by the addition of ammonium carbonate may account for that inorganic precipitation of carbonate of lime which the microscope shows must take place. There were one or two points in which one could doubt whether Dr. Murray's explanations are of universal application. For example, with regard to the secretion of carbonate of lime either as calcite or as arragonite. We know that among mollusca living together on the same banks, some have shells of calcite and others of arragonite. In conclusion, I can only repeat my gratitude to Dr. Murray for this extremely suggestive paper.

Dr. Murray: I think that pelagic organisms which secrete silica are most abundant in those parts of the ocean where there is clayey matter in suspension, as in the arctic and antarctic seas, and in the West Pacific and off the mouths of large rivers. This, it seems to me, is more important than the temperature of the water. In discussing the causes which have led to a similarity in the fauna and flora of the two polar oceans, I may possibly have been rather speculative, and have given my imagination too much rein. The interest of the subject must be my excuse.

The President: I am sure we are all very glad that Dr. Murray has given his imagination a little rein, but you must also have been impressed with the enormous labour that he undertook and has completed in giving the maximum and minimum ranges of temperature of the surface of the ocean all over the world in 2° squares. It represents a great amount of labour, and from what we have heard to-night we know that it has not been labour in vain; that it has led to most interesting conclusions, and has shown the connection that exists between physical phenomena and biological phenomena, and we can have no doubt that Dr. Murray's most valuable chart will be permanently useful in the study of meteorology and of geographical distribution. I have, therefore, every confidence that the vote of thanks I now offer to Dr. Murray will be passed with acclamation.

AN EXPLORATION IN 1897 OF SOME OF THE GLACIERS OF SPITSBERGEN.*

By Sir W. MARTIN CONWAY.

Last year (January 25) I had the honour of describing to this Society some of the results of an expedition which, in the year 1896, explored certain parts of the interior of the main island of Spitsbergen. Before that journey the interior was practically unknown. Monsieur Rabot had visited the Sassendal in 1892; and Herr Gustaf Nordenskiöld in 1890 had made the traverse over Torell glacier between two of the western bays, from Horn sound to the so-called Recherche bay of Bell sound. The result of our expedition was to show that a belt of the island bounded by Ice fjord on the north and Bell sound on the south, so far from being a region covered with ice, is practically open country, consisting of boggy hillsides and valleys, divided from one another by ranges of hills which have been carved out of a plateau. I was enabled to show, by examples, the various stages in the evolution of these hills, from their beginning in a plateau intersected by cañons to their final completion as sharp-edged, independent peaks. In no mountain region of the world, known to me, can this evolution be so plainly traced as in Spitsbergen.

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* Paper read at the Royal Geographical Society, March 14, 1898. Map, p. 224.

The expedition of 1897 was made by Mr. E. J. Garwood and myself, with the assistance of two Norwegian seamen, one of whom, Nielsen by name, was as serviceable to us as his fellow was obstructive. Our object was to investigate the interior of parts of the country believed to be covered by so-called "inland ice;" that is to say, by ice-sheets of the Greenland character. We accordingly chose two areas, to which, for convenience' sake, I have been obliged to give names. The first is the area bounded on the north by the bottom of Wijde bay and the Chydenius range of hills, on the east by the sea, on the south by Ice fjord and a line running from Temple bay across to Wiche bay, and on the west by Dickson bay; I have called this region Garwood Land, after my excellent travelling-companion. The second area is bounded by Ice fjord and Dickson bay on the east, by Foreland sound on the west. Its northern limit is approximately a line from the head of Cross bay to West fjord of Wijde bay. To this region, reviving the old English whalers' name for Spitsbergen, I have applied the designation King James Land. For the area between Ice fjord and Bell sound, explored in 1896, the name Adventure Land* is perhaps as suitable as any.

We landed at Advent bay on July 9. The little steamer that was to have met us had not arrived from Norway, so that we seemed to be stranded; but Dr. Lerner, who had taken the *Expres* for the summer, kindly offered to carry us across to Klass Billen bay. On the 10th we visited Skans bay. On the 11th, a fine day with a strong south wind, we rowed up Klaas Billen bay, little thinking that just then Andrée was ascending in his balloon from Danes gat. We landed at the foot of the Nordenskiöld glacier, dragged up our whale-boat, and pitched camp. Next day was wet; we spent it in making final preparations for an expedition up the glacier. Two sledges were loaded and dragged over a boggy and stony flat, and up a high steep moraine on to the ice. On the morning of the 13th we started up the glacier. It proved to be very much crevassed. Progress was slow and difficult. Camp was pitched about 700 feet above sea-level 3 miles inland, in the midst of a labyrinth of crevasses. On the 14th we completed the ascent of the crevassed area, and tugged on up steadily inclined snow-slopes. Fog enveloped us all the latter half of the march, and we had to steer by compass. Camp was pitched about 1500 feet above sea-level, on a little plateau at the east foot of a peak climbed by Baron de Geer in 1882. A howling storm imprisoned us in this camp for twenty-four hours. We employed the finer intervals in practising with *ski*, by aid of which the remainder of the inland journey had to be accomplished. A brief clearance enabling us to discover the best direction to take over the icy interior, we set forward again through the dense fog. Nothing was visible during the march. The snow was soft, the slope steady; the sledges travelled with difficulty. We camped again in the white wilderness. Next morning there was a short lifting of the fog, which permitted us to see westward for a few minutes, down a broad snowy valley to the line of hills that border Dickson bay on the east. The fog soon returned and blotted everything out. We marched on as before, to the north-east, with nothing visible in any direction. The slope at times steepened so much that we had to take on one sledge at a time, and then return for the other. Late in the day a howling storm burst upon us, and one of our Norwegian seamen broke down from cold, exposure, and fright. He refused to advance further, so camp had to be pitched. We were soon almost snowed under, the sledges being completely buried out of sight.

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* In this case, as in others where new names are required, I endeavour to supply them, when possible, by reviving old names fallen into disuse or oblivion. Advent bay is a senseless abbreviation of the former name, Adventure bay. It was called Klaas Billen bay by the old Dutch whalers, but this name has been moved across Ice sound to another bay, to which it is now firmly attached.

On the 18th Garwood and I left camp early in the continuing fog, and made a ski expedition to the east and north. On reaching the summit of a snowy dome, we came above the mist, and obtained a clear view to the east, where a broad glacier valley opened at our feet, leading away to the east, and then bending round south. Tributary valleys joined this one on the north. All across the north and east were plateau-fronts or bluffs of rock, with *névé* both below and above them. Garwood set forth down the valley to investigate the rocks of a nunatak; I went north up a higher snow-dome, from the summit of which I had an uninterrupted northward view. In that direction the snow-plateau continued for some distance, cut up by deep glacier valleys, beyond which were several higher mountains. Unfortunately, Wijde bay, all the hills round it, and all the region to the west of me, were buried in cloud. Late in the day we returned to camp, and found the sick man in a feeble condition. He urgently demanded to be taken back to the coast. Accordingly, we packed up camp, and set forth towards the south-east over the highest part of the snow-plateau.

The evening was most beautiful; the scenery superb. High above the clear air that surrounded us was a dark blue roof of cloud, resting on skyey walls of marvellous colours, with streaks of stratus across them, reflecting the golden sunlight. The sun itself was hidden in the north, but beneath it there hung a reticulated web, woven of gold and purple, through which the shafts of tender light drooped like eyelashes upon the snow. All around, the *névé* swept away in gentle curves and domes, greyish-white in some places with purple shadows, bluish-grey in others, here and there strewn with carpets of sunlight. The rocks, too, wherever they appeared, were rich in colour, showing their own ruddy or orange tints enforced by the lustrous atmosphere. There was none of the sharp contrast of black and white that strikes a superficial observer in high mountain views. This panorama was a glorious mass of colour, harmonious without rift, and rich without monotony. At midnight the cloud-roof opened in the north, and a flood of sunshine poured upon us. Camp was pitched just where the slope began to dip towards the head of the Nordenskiöld glacier.

Next day, in glorious weather, we descended to the foot of a mountain, the Terrier, on the left side of the Nordenskiöld glacier, opposite De Geer's peak. We meant to ascend it next day, but were prevented by regathered clouds. Some hours were accordingly passed investigating glacial phenomena in the neighbourhood, a curious long barrel-vault of ice, and a burst glacier lake which had distributed huge masses of ice over a square mile of glacier. On the 21st we rowed down Klaas Billen bay to the Goose islands, where we spent the night. Early on the 23rd we were back in Advent bay.

On the 24th we sailed in the small steamer *Kvik*, and landed next morning at the south-east angle of King's bay. Some time was spent making observations of the great King's glacier's terminal cliff, climbing a peak in the neighbourhood, and preparing for another journey inland. We started, with two new sledges, up the south side of the King's glacier on the morning of the 27th. For the first two days the humpy and crevassed ice and the great moraines caused us infinite labour. We thus gained the King's Highway, the great south-east tributary of the King's glacier. Here were several miles of water-sodden snow to be traversed, and several broad glacier rivers to be crossed. The third march brought us to near the watershed, and on the morning of the 30th we stood on the actual pass, and could see down the whole length of the glacier we had come up, and of another glacier in the opposite direction leading down to Ice fjord, beyond whose waters Advent bay was clearly visible. For the sake of a wider panorama, we climbed to the top of a neighbouring snowy hill (Highway dome, 3000 feet). The weather was fine, and the view most comprehensive. In all directions were a countless multitude of snowy hills, with a labyrinth of *névés* and glaciers amongst them. The remainder of the day was spent in surveying, the sun being painfully hot in the clear air.

Next day we went south over a snow pass, and down on to the *névé* of the next great glacier, which we supposed would likewise flow into Ice fjord. It is a very large glacier, but it bends round south and then south-west, and empties into the head of St. John's bay. Returning by the pass at the head of this glacier, we went down the southern branch of the Highway glacier, and rejoined our old tracks after a long march.

In the angle between the two great branches of King's glacier—Highway glacier and Crowns glacier—stands the fine mountain-group of the Crowns, well known to the old navigators from their remarkable appearance as seen from King's bay. On August 1 we climbed to the top of a pass over a spur of this group, and next day descended to the left bank of the Crowns glacier, where we encamped at the foot of a dolomite peak, named Pretender (3480 feet), on which we did a day's scrambling, whilst the men returned to the coast for stores. August 4, we moved camp over difficult glacier as far as the foot of the Middle Crown. We climbed the peak (4000 feet), and had a remarkable view, embracing the enormous *névé* of the Crowns glacier, the Cross bay mountains beyond it, the great plateau at its head, cut up into *névé* valleys (like those in Garwood Land) draining south-east towards Ekman bay. South was the irregular mountain region of King James Land. Ice fiord was clear, with the hills of Adventure Land beyond it. In the remote distance we thought that we identified the towering wall of the Hornsunds Tinder.

On the 5th we made an 18-mile *ski* expedition over the *névé*, and climbed a higher peak of the same group, the Diadem (4150 feet). The view was similar to that from the Middle Crown, but more extensive to the north. We climbed the Middle Crown again on the 6th. The 7th and 8th were spent returning down difficult glaciers to our base camp by King's bay. Throughout the whole of this inland expedition we enjoyed the most perfect weather it is possible to imagine. The four days that followed were devoted to boat expeditions in King's bay, but the weather was foggy, and little surveying could be accomplished.

On the 13th we reached and finally quitted Advent bay. We steamed down the west coast, and were dropped in Horn sound on the 14th. Here a week was spent. There was only one fine day (the 18th), on which we climbed to the highest point of Mount Hedgehog, one of the Hornsunds Tinder, though unfortunately not quite the highest point of the range. Mount Hedgehog is the peak the ascent of which was attempted in thick weather by Mr. Garwood and Mr. Trevor Battye in 1896. They reached a high point on the side of the mountain, and then were compelled to descend. Fortune was kinder to us. There was a flat floor of cloud at a level of about 1000 feet, but above that all was clear, and we enjoyed a marvellous and most instructive view, which revealed the geography of all the south part of the island. On the 21st the steamer *Lofoten* called for us on its way to Norway. Landings were made at Bear island and the North cape. Thus an interesting expedition was brought to an agreeable conclusion.

Both Garwood Land and King James Land are described on the chart as covered with "inland ice." Now, if the phrase "inland ice" merely means glaciers, so that it may be correctly applied to the glaciers of any district of snow-mountains, such as the Alps or Caucasus, it is a useless phrase, and ought to be abolished. Most persons of whom I have inquired, receive from it a different impression, and judge it to be descriptive of a complete and continuous icy mantle enveloping a whole country, as Greenland, for instance, is enveloped. The term is used in that sense in the English edition of Nansen's 'Greenland.' "Ice-sheet" is apparently a better descriptive term for such a mantle, and I shall accordingly so employ it. The term "inland ice," being essentially vague, should, I think, be erased from geographical literature, or used only as a non-committal descriptive term to designate the ice covering some unexplored region vaguely known to be glaciated. As long as a flowing body of land-ice is contained within definite watersheds and mountain ranges, it is a glacier and not an ice-sheet. The juxtaposition of no matter how many glaciers does not form an ice-sheet, but merely a glacial area. It is necessary to be thus particular in definition because, as I shall presently show, neither Garwood Land nor King James Land, nor any large part of Spitsbergen, except New Friesland and North-East Land, is covered by an ice-sheet. They are all merely glacial and mountain areas. The discovery of this fact is the principal geographical result of our second expedition. That it is a not unimportant result I now proceed to demonstrate.

The old theory that glaciers excavate their beds to any considerable extent is practically abandoned. Its supporters naturally considered that the larger the mass of ice the more vigorous would be its excavating action. A great arctic ice-sheet was considered to be an extraordinarily powerful excavator. We now know that moving land-ice does not so operate upon its bed, but, beyond polishing the surface of the rock it covers, and cutting down convex excrescences, has mainly a conservative effect upon it. In the case of a country, like the interior of Greenland, wholly buried under ice, the buried land-surface is being modelled to a very slight degree. On the other hand, in the case of a glacial region, where mountains rise above the mean level, and where rock-faces are exposed to the rapid denudation of all snowy regions, great developments of surface-formation are going forward. Under an ice-sheet, the forces acting on the land-surface are conservative; in the case of a glacial region, the acting forces are formative. Hence the immense importance of clearly distinguishing between these two types of ice-bearing country.

In the glacial regions of Spitsbergen are many cliffs of disintegrating rock, such as the one depicted in the accompanying photograph taken by Mr. Garwood on Highway Dome, where there is *névé* or glacier both above and below the cliff. In such a case the cliff, by the action of frost and aërial denudation, continually moves backward. Its exposed face is being constantly peeled off, and the *débris*, falling upon the glacier, is not suffered to accumulate and so to protect the base of the cliff, but is carried away. The cliff thus maintains its existence, but moves continuously backwards, just as the cliff retreats over which Niagara falls.

In the accompanying diagram (Fig. 2), the glacier DE has at its head such a cliff, CD. This cliff, therefore, steadily eats its way backward, possibly enough becoming shorter and shorter in the process. As it moves backward, the catchment area of the glacier's snow-field increases, and the glacier therefore tends to advance at its snout. If CD were the face of a sufficiently thick mountain mass, it would gradually eat its way into that mass, till the precipice had, by continuously shortening, disappeared, and the slope of the glacier reached right up to the top of the mountain mass, as in Fig. 1.

But if CD is the face of a relatively thin rock ridge (as in Fig. 2), the glacier DE will eat its way through that ridge; and if, in the valley on the other side of that ridge, there be a big glacier whose direction of flow is at right angles to that of the glacier DE, the glacier DE, when it has eaten back through the ridge BCD, will carry away the upper portion of the longitudinal glacier, draining it off down its own side valley, and will establish a col between the former head and the snout of the original longitudinal glacier.

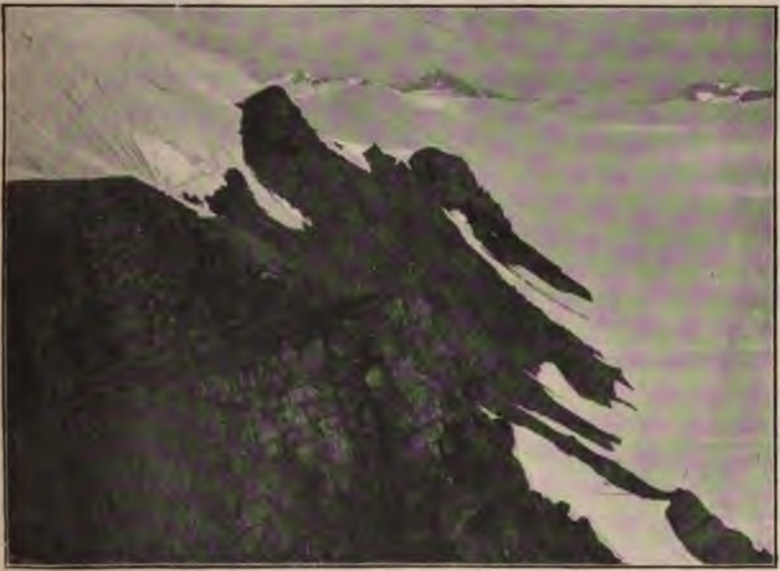

FIG. 1.—SOUTH FACE OF HIGHWAY DOME.

In fact, in such a case it would happen with the glacial drainage as in the Himalayas and elsewhere it has happened with the rivers. When the great Asiatic plateau was elevated, whereof Tibet now alone remains in anything approximating to the original surface condition of the whole, the drainage ran off along the hollows in the line of the crinkling of the surface coinciding with the strike of the strata. Now, however, by the operation of rivers eating their way back into the plateau at right angles to the strike of the strata, all the great rivers flow at right angles to their original direction. The Indus was originally a stream no bigger than the Swat river, flowing down the edge of the elevated region. It ate its way through the Nanga Parbat range into the depression which goes on to Gilgit, and thus robbed all the waters of the upper Indus of to-day, which in the remote past, I believe, discharged themselves (over a high region since excavated into mountain ranges) into the Kunar river, and before that into the Oxus. Similarly, a branch of the Gilgit river has eaten back through the Rakipushi range and robbed the Hispar-Hunza river, and a branch of that has eaten back through the Boiohagurdoanas range, and is now cutting through to the Taghdumbash Pamir. It is worth notice that in each case the river has chosen the neighbourhood of the highest point of the range for its transverse gorge, not improbably (as it seems to me) because there it had a glacier to help it as a

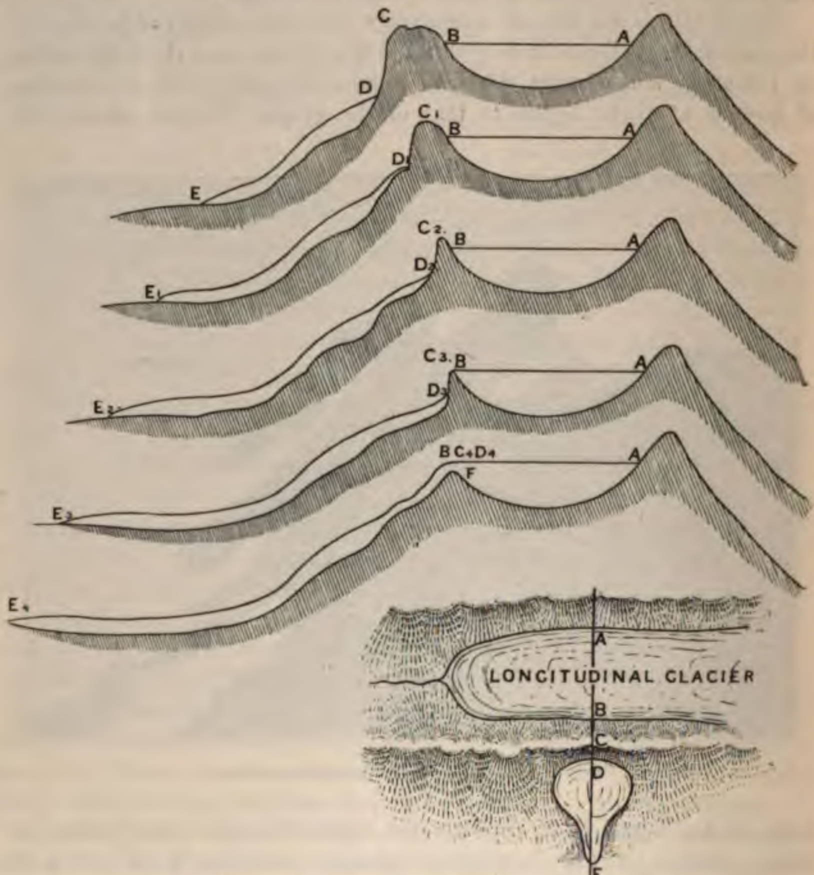

FIG. 2.—DIAGRAM ILLUSTRATIVE OF CLIFF DISINTEGRATION.

carrying agent in cutting through the range. In the case of rivers, this eating-back process is well recognized and understood. I suggest that it is likewise true of glaciers, though of course the phrase "eating back" is used as descriptive of the effect produced, not of the glacier's action. The "eating back" is caused by aërial denudation, not by glacial erosion; but if the glacier were not there to carry away the *débris*, the processes of aërial denudation would be arrested by the accumulation of *débris*.

The best instance I can quote of what seems a clear case of one glacier robbing the *névé* basin of another is in the Karakoram mountains. There the Biafo glacier drains a great snow-field, which appears geographically to belong to the Hispar glacier. When the incredible rapidity of denudation in those regions is remembered, it seems far from impossible that the ridge which bounds the Hispar glacier on the south extended unbroken, and not so very long ago, across the Biafo glacier, and that the gap through which the Biafo glacier now draws off the snow-field behind, is only of recent formation.

Few persons, however, are familiar with the geography of this remote region; it seems, therefore, best to illustrate the theory above propounded, by some possible example nearer home. I cite, but with diffidence, two cases from the Alps, where it seems possible that well-known glaciers may have eaten back a gap through mountain ridges. In both cases, no doubt, the eating back may have been done by water; all that I assert is that, if not done by water, it would have been accomplished by the glaciers which exist on the spot.

My first example is taken from the Mont Blanc range.* I suggest that originally there may have been a glacier with its head near the present summit of Mont Blanc, having for its left bank a ridge (or plateau-edge) now represented by the Aiguille du Midi and other aiguilles, the Aiguille Verte, the Aiguille du Chardonnet, and the Aiguilles Dorées; whilst its right bank was approximately coincident with the modern watershed as far as Mont Dolent, except between Mont Blanc de Courmayeur and the Tour Ronde, where it has been broken away. This ancient drainage system has been broken down, and now the snows of the upper reservoirs are all discharged by such glaciers as the Mer de Glace or the Glacier d'Argentière, which cut across one or other of these old containing ridges or plateau-edges.

Thus too, I suggest, the Upper and Lower Grindelwald glaciers and the Rosenlaui glacier may have invaded the Oberland plateau and crept back into the heart of the mountain mass, isolating as high individual peaks the Wetterhorn and Schreckhorn. Originally they were mere "corrie glaciers," plastered on to the north face of the plateau—just such glaciers, in fact, as the Guggi glacier, which lies in the hollow between the Jungfrau and the Mönch. They have crept farther back than it, because for some reason they had the better start, but the Guggi glacier now emulates their former vigorous initiative. The cliffs at its head are being continually broken and worn away by the action of frost. The rocks that fall from them either tumble on to the *névé*, and are carried down by it, or roll into the *bergschrund*, and so get under the ice, where no doubt they are ground to dust, and do some excavating in the process. That, however, can only be in the upper regions; lower down only the waters below the glacier excavate, but not the glacier itself, except, perhaps, at the edge of some subglacial cliff where an icefall is formed. In this way the rocks of the north face of the ridge between the Jungfrau and Mönch are being eaten away, and the ridge itself is not merely being lowered, but its crest is being pushed backward towards the south. Every yard of its movement is made at the expense of the Jungfrau glacier. Let the process go forward for a sufficiently long time, and the area now occupied by the upper basin of the Jungfrau glacier will be occupied by a snow-basin lying at a lower level, and draining northward down the Guggi glacier.

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* Herr Imfeld's new map is the only one on which this theory can be properly examined.

Similar, I suggest, may have been the development of what is now the Great Aletsch glacier. Originally, according to this theory, the Lötschen glacier stretched back to the Finsteraarhorn, and had for its left bank a ridge parallel to, but south of, the range of which the Aletschhorn is now the culminating point. The Aletsch glacier's original head was on the south face of this range, but the glacier ate its way backwards, its head advanced to the north, finally broke its way right through the range and drew off a portion of the ice of the Lötschen glacier.* The snout of the Lötschen glacier was thus disconnected from its former *névé*, and a pass (the Lötschenlücke) was formed between them. The *névé*, at what is now called the Place de la Concorde, flowed as a great icefall over the remnant of the old left bank of the original glacier. It no doubt deepened and widened the breach, and as it did so lowered the level of the snow in the upper reservoir, whose various branches were thus enabled, each in its place, to creep backwards also at the expense of the plateau. Thus were formed the Ewig Schnee Feld, the Jungfrau Firn, and the other *névé* tributaries of the present great glacier. The great icefall gradually diminished in turbulence as the cliff beneath it was broken and rounded away, till now it is merely represented by the crevassed area just below the Concordia Hut.

Whether, in fact, the processes thus suggested took place, or whether water-action forestalled the glaciers by cutting through the ridges in days anterior to the glaciation of the Alps, I am not authority to pronounce. But the position that I do maintain is this—that glaciers would have cut back and produced the mountain and valley forms that we see in these cases, if water did not anticipate them. That glaciers do not excavate their beds to any considerable extent is now practically admitted; but that, by acting as carrying agents, they eat back into the mountain-masses they drain, and thus perform a great function in the processes which go to the shaping of mountains, is a fact which I think has not been sufficiently emphasized. It follows that the distinction I have endeavoured to make between an ice-sheet and a congeries of glaciers is a distinction of the first importance; for under an ice-sheet none of the processes are going forward which are vigorously proceeding in a glacial region. The old idea of Spitsbergen was that its interior consisted of a great ice-sheet, fringed at the edge by a number of boggy valleys and green hillsides. Our explorations have shown the utter falsity of this conception.

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* The Walliser Viescher glacier was similarly employed.

Whether at one time the whole island was enveloped in an ice-sheet which was gradually withdrawn from the west towards the east, or whether the west part of the island has merely been longer raised above the sea than the east part, I do not attempt to determine. The fact, at any rate, seems to be that the forces of denudation have been longer at work, or, at any rate, more vigorously at work, all down the west part of the island, and that the resulting mountain formation is most developed in the west, and becomes continually less developed as you proceed toward the east. All down the western region you find highly specialized mountain-forms—peaks and ranges of considerable abruptness and marked individuality. As you advance eastward the mountains become generally more rounded, till the original plateau-form, and even parts of the undenuded plateau itself, are encountered.

Bearing in mind this general structure of the land-surface, it will now be easy to describe the character of different parts of the main island. The whole of the north coast, as might be expected, bears evidence of a more rigorous climate than districts further south. This was specially noticed by us when proceeding down Wijde bay, at whose mouth the snow lay down to sea-level in the month of August, whilst, 20 miles in, the snow-line was almost 1000 feet above sea-level. The northern rim, therefore, may be regarded as a separate geographical division. At the north-west angle of the island is a region of very bold mountains and large glaciers. It is well represented by the beautiful and often described Magdalena bay. Nothing is known about the interior south-east of it, but some old Dutch charts mark a valley leading from the east side of Mauritius bay up to a sequestered lake in the hills. Whether the draughtsman intended his winding valley and river to represent a glacier and the lake a snow-field, or whether a true lake and river existed here in the eighteenth century, can only be settled by an examination of the ground.

Passing southward down the west coast, we come to the seven parallel glaciers ending in the sea, known to the whalers as the Seven Icebergs. These all appear to flow down from a high common snow-field which stretches east toward Wood bay and south almost to the head of Cross bay. South-eastward this high plateau is broken by a series of *névé*-valleys, the chief of which discharge themselves towards Ekman and Dickson bays. Their general direction is south-south-east. South of this plateau region comes the mountainous area of King James Land, whose character is shown on the accompanying map. The main watershed here runs north and south. A series of parallel glaciers drain south-south-east from it to Ice fjord. The valley system on the west is less regular, but the glaciers are equally numerous and fine.

The deep north-and-south depression filled by Wijde bay and Dickson bay is bordered on the west by a range of mountains, a group of which intrude between and divide the bays. Some of these are of striking form, but no one has ever been amongst them or accurately determined their position. East of the two bays comes the plateau region. Its edge is cut up by a few deep valleys, down which the ice-sheet of New Friesland sends glacial tongues to Wijde bay, but east of Dickson bay the marginal valleys are longer, and no glaciers come very far down them. The portion of the plateau between Dickson and Klaas Billen bays is a good deal cut up by deep valleys, such as the Rendal, the Skans valley, and the Mimesdal (all well known to geologists), but there are no large glaciers found upon it. Further east comes a great glaciated area approximating in appearance to an ice-sheet, but with many exposed faces and peaks of rock. From it several large glaciers flow into the sea, namely, the glacier that ends in the head of East fjord of Wijde bay, the glacier that fills a wide valley debouching into Hinloopen strait opposite the South Waiigat islands, some more glaciers that empty into Bismarck strait and that neighbourhood, the series of great glaciers at the head of Wybe Jans water, and the Nordenskiöld glacier (specially explored by us) near the head of Klaas Billen bay. All these glaciers are divided from one another by more or less well-marked watersheds.

The neck of Spitsbergen, which may be defined as bounded on the north by a line from the mouth of Nordenskiöld glacier to Wiche bay, and on the south by the Sassendal and the depression across to Agardh bay, is a district that would well repay exploration, and is easily accessible from the Post glacier at the head of Temple bay. Nowhere are the phenomena of mountain formation by plateau degradation under the action of rivers and glaciers better illustrated than here. In the east there are the remains of an ice-sheet; in the west there are deep and wide glacier and river valleys. Between the two are many mountain ranges, and some peaks of considerable height and abruptness.

A line drawn from the head of Van Keulen (Saardam) bay to Whales bay forms the southern limit of the next region to the south—the region that I call Adventure land. It is a country of boggy valleys, rounded hills, and relatively small glaciers. Originally it was one large plateau, formed of soft, almost horizontally bedded rock, except along its west margin. It has therefore been penetrated by wide valleys radiating in all directions and cut down almost to sea-level. A range of rather fine peaks lies along the west coast, and behind that are some large glaciers descending north into Green harbour and south to the mouth of Low sound. Then the undulating country begins. Several valleys lead inland from Coles bay, whilst from Advent bay starts the Advent dale with its many branches. From Low sound a series of boggy valleys strike in to north and south. At the north angle of its head opens the deep valley of the Shallow river (after the Sassendal the largest valley in Spitsbergen), whose upper part has never been explored. The eastward prolongation of Low sound, which was known to the Dutch as Michiel Rinders bay, is very poorly charted, but we know that at its north angle there is a secluded inner harbour, with a big ramifying valley leading back from it, whilst at its extreme east corner three large glaciers debouch together, one of which probably connects by a high snow-field with the head of Strong glacier descending to Whales bay.

Last comes the south division of the island, over which we had a panoramic view in 1897 from the summit of Mount Hedgehog, one of the Hornsunds Tinder. Unfortunately a roof of cloud covered the glaciers, and we could only see the tops of the mountains rising clear above it. The north-west angle of this region was explored in 1897 by Mr. Victor Gatty, who found it to consist of a ring of snowy mountains surrounding the *névé* of the Fox glacier, which discharges into the so-called Recherche bay. A gap or col, south-east of Dunder bay, separates this group from a range of hills running for some distance south along the coast, and called Roebuck Land. The extremity of these hills abut against the right foot of Torell glacier, one upper bay of which rests against the hills immediately south of Recherche bay, whilst another stretches inland to the east, as far as the main watershed of the island. There are one or two other approximately north and south ranges of hills lying west of this watershed. East of it the plateau-character resumes its predominance. The southernmost part of the island, south of Horn sound, is dignified by the boldest mountain range in the country, that of the Hornsunds Tinder, which lie west of the watershed, and run almost due north and south. East of them are at least two lower parallel ranges, beyond which the ice-covered country seems to dip to the sea.

Of the other islands in the Spitsbergen group, North-East Land is the largest. It is known, from Baron Nordenskiöld's exploration, to be covered with a true ice-sheet, the edge of which descends to the sea all along the south-east coast. The north coast and the small islands off it altogether resemble the northern belt of the west island. The west belt is a low undulating region, from which the ice-sheet has retreated in relatively recent times.

South of North-East Land are two islands, now generally known as Swedish Foreland and King Carl island. These were the "high land," discovered by Giles and Reps in 1707, when they circumnavigated North-East Land, and returned northward by way of Hinloopen strait.* It has generally been supposed that the Wiche Land of Captain Edge was the same pair of islands, but I think that this was not the case. In the years 1616 and 1617 explorations were made to the eastward of Spitsbergen on behalf of the Muscovy Company. Their results are only recorded on Thomas Edge's map, printed in Purchas, and again in Pellham's 'God's Power and Providence,' etc. (of 1631). Edge states (in Purchas) that, in 1617, a ship of sixty tons, with a crew of twenty men, "discovered to the eastward of Greenland [= Spitsbergen] as farre to the northwards as 79 degrees, and an iland which he named Wiches iland,† and divers other ilands." From the map, it is clear that both coasts of Wybe Jans water, right up to its northern extremity,‡ were explored, as well as the north-east coast of Edge Island; but that the eastern extremity of the latter was not reached, still less turned. In fact, the exploration did not extend to any part of the sea east of Edge island. A landing was certainly made on Barents island, for reindeer are marked on it. Doubtless some high point was climbed there on a clear day, and the southern mouth of Hinloopen strait was seen and the extremity of North-East Land, which is marked on the map, "Sir Thomas Smyths Iland." From the same point, no doubt, Swedish Foreland might have been seen, but, if it had been, it could not possibly have been marked as a long north and south coast-line lying between about lat. 76° and 78°, but must have been placed in or above lat. 79°. The *Wiches Lande* of Edge's map, therefore, was not seen from a hill on Barents island; nor was it seen from the sea east of Edge island. But, if seen at all, it must have been seen from some point of land or sea depicted on that map. It was not seen from a hill on Barents island; neither was it seen from the sea east of Edge island, and *à fortiori* not from the sea east of Barents island. Hence it cannot be the same as King Carl's island and Swedish Foreland. In fact, it corresponds to no existing land at all, and doubtless merely represents some bank of fog or other deceptive atmospheric phenomenon.

I have never landed in Barents or Edge islands, though I have seen both from east and from west. Neither possesses an ice-sheet. Both are practically devoid of glaciers down their west coast, and have large glaciers in the east. The whole of the south-east of Edge island is occupied by a great glacier ending in the sea. Barents Land has several sharply pointed peaks, but the Edge island hills are mainly flat-topped, like those along the east coast of the main island.

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* See the great chart, "Nieuwe afteekening van het Eyland Spitsbergen op gegeven door de Commandeurs Giles en Outger Rep en in't ligt gebraght en uyt gegeven door Gerard van Keulen Boek en Zeekaart verkooper aan de Nieuwen brug met Previlegie voor 15 Jaaren."

† After Richard Wiche, a governor of the Moscovy Company.

‡ Which is in 78° 40′, but is marked by Edge as extending to about 79° 15′.

Prince Charles Foreland now alone remains to be considered. It is very badly represented on the existing chart. At its southern extremity is an isolated hill. Then comes a very flat plain of about 50 square miles, raised but a few feet above sea-level. Next comes a mountain range consisting of fine, sharp snow-peaks. It is cut off on the north by a deep depression, running in a south-west direction from Seehonde bay, which, though marked south of St. John's bay on the chart, lies some miles north of it. North of Seehonde bay and valley the mountain range is continued, but the peaks, though fine in form, are not so high as those of the south group, but they send down eastward an almost uninterrupted series of glaciers into Foreland sound. Further north are yet lower snowy hills, which end in the bold headland called Bird's cape or Fair Foreland.

Before the reading of the paper, the CHAIRMAN (Sir Charles Wilson, Vice-President) said: I am sorry to say that our President is confined to his house by a bad cold, and he begged me to make his excuses for not being here this evening.

Sir Martin Conway is so well known to you all, that it is quite unnecessary for me to say any words of introduction, and I will ask him at once to commence his lecture on "An Exploration in 1897 of some of the Glaciers of Spitsbergen," which I am sure will be very interesting.

After the reading of the paper, the following discussion took place:—

The CHAIRMAN: There are several gentlemen here who I think we should like to hear this evening, and I will first of all call upon Mr. Garwood, who was with Sir Martin Conway in his last expedition.

Mr. E. J. GARWOOD: In deference to the request of our Chairman, I rise to say a few words, although I am afraid the time is getting late. I must ask you to make allowance for my feelings, labouring as I am under the novel sensation of possessing, for the first time in my life, some real territory of my own. Having been told before the meeting that you might like to hear a word or two about the geological features of the country which we explored this year, I have purloined one or two of my slides from Sir Martin's box with which to illustrate the subject.

The first point to which I should like to allude is the height of the snow-line in Spitsbergen. Many of you may be under the impression that in Spitsbergen the snow-line comes down to the sea-level. Before my visit two years ago, I imagined that the typical scenery so characteristic of our own climate was totally absent from the arctic regions; that is to say, that curious denudation curve, that logarithmic curve, so characteristic of a humid climate like our own, and so well seen in the valleys of Scotland and the lake district in Cumberland. I was surprised, however, to find that in the low valleys, where unoccupied by glaciers, this was not the case. We have there true denudation curves produced even up to a height of 1200 to 1500 feet on the western coast of Spitsbergen. This is well seen in photographs of the northern slope of the Trident, in the Sassendal, where the beautiful curve and the wonderfully symmetrical gullies are evidently the work of running water acting during the short summer months.

In our explorations in the more glaciated district further to the north last summer, about which Sir Martin has told you to-night, we found scenery of a markedly different type.

Rising as they do through the inland ice system, whose surface in the interior of King James Land stands at a height of upwards of 3000 feet, the mountain ridges stand out with sharp and cleanly cut contours. These nunataks show a marked absence of the denudation curve alluded to above, and their bold and precipitous outlines are evidently the work of frost alone. This is especially apparent in the range of peaks of which the Three Crowns form the most westerly outliers (Fig. 3).

Without entering into the detailed geology of the district, it is interesting to note the influence exerted by the geological structure on scenery sculptured by frost alone. This influence is much more marked here than it is in a humid climate, where the surface features have been carved by the action of water.

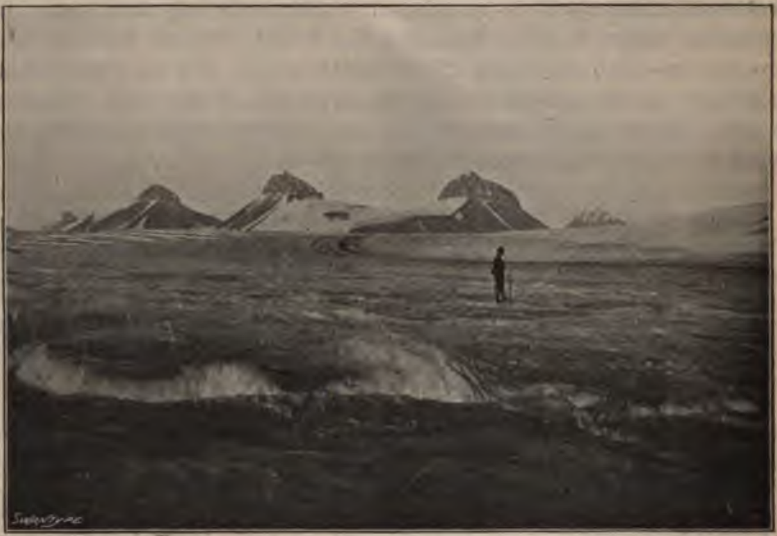

FIG. 3.—THE THREE CROWNS, KING'S GLACIER.

The terminal pyramids of the Three Crowns are composed of carboniferous dolomite, lying nearly horizontally, and traversed by well-marked vertical joints. It is along these planes that the action of frost is most marked, resulting in the production of perpendicular cliffs, frequently quite inaccessible. A sharp line can, however, be drawn at the base of this formation, where it rests on the purple Devonian (Silurian ?) shales. In the latter formation, the absence of joints and the friable nature of the shales has resulted in the formation of gentle scree slopes, forming an angle of some 140° with the limestone cliff above. It is thus that we have produced the characteristic rock forms to which the name of the Three Crowns has been so aptly applied. The clean-cut diadems of golden dolomite cushioned on the purple folds of their Devonian pedestals stand like silent monuments of vanished empires.

It is always pleasant to meet old friends, and the fossils enclosed in the limestones recalled days spent on the slopes of Ingelboro', while the fish remains entombed in the Devonian shales had close affinities with the classical collections from the Old Red Sandstone of our own islands.

Here and there, as at the base of the Pretender, rise islets of an earlier age, lifting their heads through their icy covering, and I am proud to state that my patrimony to the East also dates from these Archæan times.

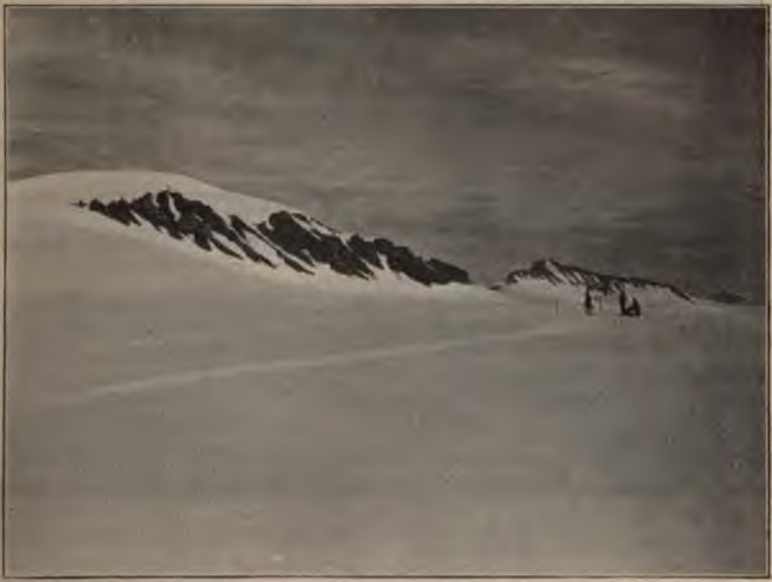

FIG. 4.—THE SUMMIT OF THE KING'S HIGHWAY.

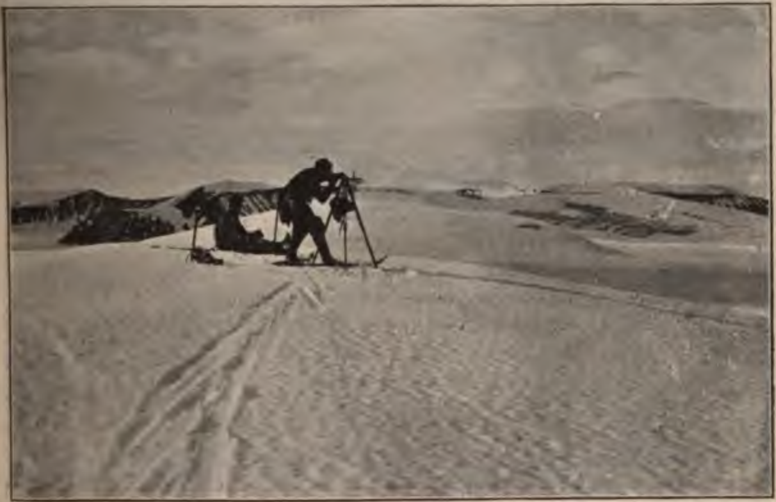

FIG. 5.—HIGHWAY DOME, KING JAMES LAND.

The position of these carboniferous rocks to the north of Highway glacier requires a word of explanation. Their occurrence here appears to be due to a vast dislocation or thrust running south-west from King's bay, which has brought up the older schists on the south side, and let down the whole of the carboniferous area on the north, for we find patches of carboniferous rocks let in against the schists on the south side of Highway pass. The disturbance curves somewhat on the south

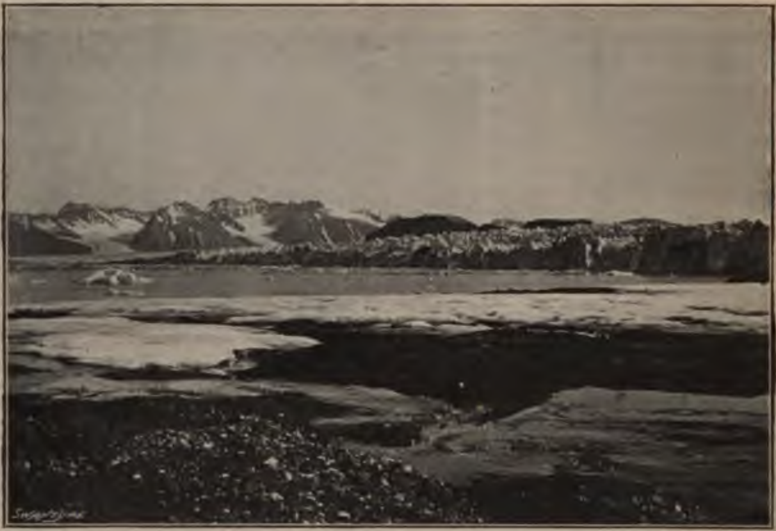

FIG. 6.—KING'S GLACIER AND BAY.

FIG. 7.—THE LAST CAMP NEAR MOUNT CHEIDENIUS.

shore of King's bay, causing the carboniferous beds to be tilted on end, and run as a broken ridge across the entrance of Ice fjord and Bell sound, in which latter bay the ridge forms the interesting little Axel island.

I would call your attention to some novel and somewhat interesting structures which we met with this year. They occurred both on the ice of Nordenskiöld glacier, and also on the King's glacier at the foot of the Pretender. They consisted of long arched tunnels running in parallel rows on the surface of the ice, and rising from 3 to 8 feet in height above the general level of the glacier. When we first saw these tunnels on Nordenskiöld glacier, we were inclined to attribute them to surface streams frozen in winter and arched by expansion into their present forms, but after a careful examination of those at the foot of the Pretender, I have come to the conclusion that they result from the snow bridges which here, as in Switzerland, span the crevassed portions of the ice, but which here, owing to the rapid melting and intense frosts, are converted into ice. On reaching smoother and more level reaches of the valley, the walls of the crevasses close up, and the bridges are thus forced up into these arched tunnels by lateral compression.

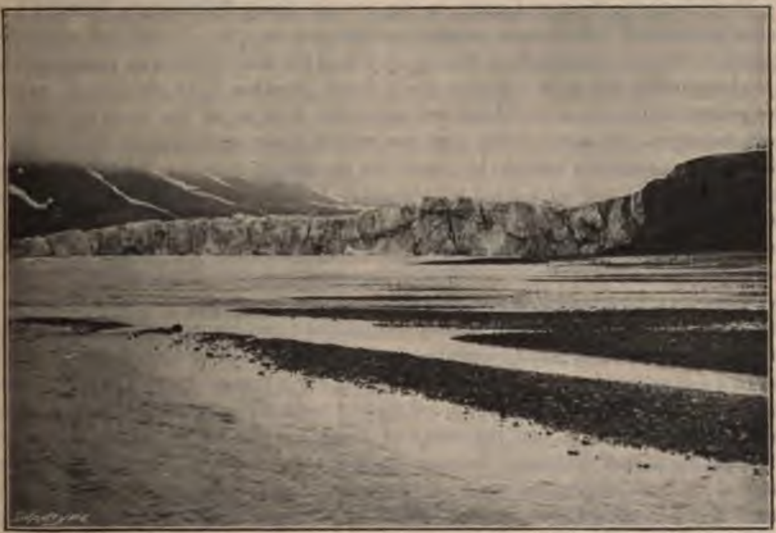

FIG. 8.—NORDENSKIÖLD GLACIER CAMP.

An interesting result of river-action which we came across this year on the ice consisted of horizontal tunnels excavated, not on the surface of the glacier, but in the heart of the ice. One of these, which occurs on the left bank of Highway glacier, had a diameter of 12 to 15 feet, and was nearly circular in section. It was evidently produced by the discharge of a lake which formed between the ice and mountain range to the south, along the line of the thrust-plane described above. This lake would be dammed up every spring by the winter snow, but in summer it would empty itself almost instantaneously as soon as the barrier was broken through. In rushing through the ice-tunnel it carried with it innumerable fragments of rock, which it deposited all over the floor of its channel. This channel ran at right angles to the direction of Highway glacier, and we have here an instance of one possible origin of the gravelly ridges known in our own country as *kames* and *eskers*; for on the retreat of the ice now occupying Highway valley, this material will be deposited on the floor of the valley, forming a ridge of gravel containing glaciated and water-worn fragments running at right angles to the final drainage-line of the district.

If we examine photographs taken from Mount Nielson, and looking south-east across the island, it will be seen how little was known of the interior previous to our visit; for instead of the "High inland ice" which appears written across the chart at this place, we find, as shown by the photographs, ranges of mountains stretching across the island to North fiord (Figs. 4 and 5).

I cannot resume my seat without attempting to bring home to you something of the beauty and delicacy of the colouring, which is such a characteristic feature of midnight scenery on the coast (Figs. 6 and 7). The photograph (Fig. 6) was taken about 1 a.m., while cruising along the shore of King's bay, threading our way in the whale-boats through the countless icebergs broken off from the front of the King's glacier.

Prof. BONNEY: I am not going to say a word about Spitsbergen, because I am one of those most unfortunate people who have not seen it. I shall only venture a remark or two on a comparison which my friend Sir Martin Conway made between Spitsbergen and the Alps. I very much doubt whether it is possible to explain the general structure of the higher valleys in the Alps as he has done by reference to Spitsbergen. It seems to me that you cannot make any comparison between a district comparatively narrow in regard to its height with one like Spitsbergen, which is carved out of a kind of plateau. And, in addition to that, I may say that the present Alpine valleys seem to me to follow the ordinary lines of denudation, and resemble valleys that have been excavated by water in most parts of the world. But the fact is that so much sculpture work has been done on the Alps since the time they first began to rise that it is almost impossible to conjecture what their original structure was. I think that slight resemblance which he detects in one or two places to a plateau country, is the effect of the two disturbances the central Alps underwent while they were assuming their present form. In that district the great disturbances of the second elevation were concentrated on the northern side, and this no doubt had the effect of throwing that range rather abnormally high, giving a sort of trough between it and an outer range, which may at one time have been the actual crest of the ridge. But I do not think it possible that we can regard the lower Aletsch glacier as made by a small glacier eating back into the main upland valley which once, he presumed, drained towards the Rhone. Because of this—the structure of the Alpine valleys is certainly preglacial; that you can see in every part. You may notice it in the Pontresina district, and in the Val Bedretto. You can see in those very hard rocks that the glaciers have been down in that narrow V-shaped valley almost in the water's edge. Well, in addition to that, when you come to look at the cirques in the limestone districts, one cannot see how those can have been eaten back very appreciably if their beds were filled with *névé*, and further, it is evident from the way they are connected with the valleys, that if the valleys themselves were occupied down to their present beds by ice, so too the beds of the cirques must be occupied. But it may be said, perhaps, there were glaciers before the days of the great ice-age. No doubt, but still, were they glaciers of much importance? When the Alps were first upheaved, the temperature of Switzerland must have been at least 16° higher than it is at present. The effect of that would be to change the position of the snow-line, and, assuming the Alps to be at their present elevation, if the mean temperature were 16° higher than it is at present, you would practically have no glaciers at all, because the snow-line would be about 13,000 feet. With that it would be impossible to talk of this cutting. No doubt the temperature fell steadily to the ice-age, but my point is that, putting the two things together, namely, the valleys having existed before the ice, and the improbability of there having been any great masses of ice, it is very improbable that material changes, such as the tapping of that upland valley by ice now forming the lower portion of the Aletsch glacier, ever would have occurred. I think, therefore, my friend Sir Martin Conway has really tried to stretch a truth to rather more than it will bear. He has, no doubt, spoken of what is a true cause in modifying the heads of glaciers, but I do think we cannot call it more than a secondary cause, and, at any rate, whatever may be its effect in Spitsbergen—and I cannot say anything about that, because I have not been there—I do not think it has produced any material effect in modifying the structure of the Alps.

Mr. MARR: I have, in the first place, to thank the lecturer for his very able and interesting paper. Geologists are apt to state that geology is the geography of past times. Of course, you may at once retort that shows geologists are geographers not up to date. As it is rather late, I want to refer to one thing only, and that is that very charming diagram which Sir Martin Conway showed on the screen, the diagram where the glacier extended up the hillside, and was gradually robbing a larger glacier; the tear-drop extended until at last the whole of the hillside seemed to dissolve in tears. I would suggest, from a geological point of view, the robbery would have been better without the extension of the tears, for I believe that, although the glacier is largely responsible for draining off one valley system into another, the process is not due to the upper extension of the glacier, but to the action of the weather on the solid rock. The glacier is simply responsible for clearing away the *débris* which the weather has brought down, so that I fancy Sir Martin would make his case better if he did not put that upward extension in.

Sir ERASMUS OMMANNEY: As an old arctic navigator, I wish to express my admiration of what has been accomplished by this expedition. We are extremely indebted, I am sure, to Sir Martin Conway for striking out a new line of exploration in the arctic regions. Whatever we have done hitherto has been by coast navigation; he has had the courage to undertake the inland exploration, and to bring before us the physical features of the interior of Spitsbergen. Sir Martin Conway's experience as an alpine traveller has been able to provide us with the information he has brought us to-night. I believe that we have rarely had a traveller who has brought before us so vividly and so graphically all that he has seen. He has derived a vast amount of glacier information with such a very small party, from the highest elevations as yet attained in Spitsbergen.

Dr. J. W. GREGORY: I have listened to the paper to-night with very great pleasure. It was my privilege two years ago to accompany Sir Martin Conway on the expedition to which the one just described was the sequel. Of the country which has been so graphically described by Sir Martin Conway, and which has been so beautifully illustrated by Mr. Garwood's lovely photographs, we caught occasional glimpses in 1896; in that year, as in 1897, the district appeared to be always bathed in sunshine, which was very tantalizing to us then, as we were nearly always wrapped in fogs. But last year Sir Martin Conway and Mr. Garwood had the benefit of the sunshine, and we have had the benefit of it to-night in the photographs which it enabled them to take. In regard to the geological theory in Sir Martin Conway's paper, I agree with the views expressed by Prof. Bonney, and I feel considerable doubt as to how far the agency invoked has been a valuable factor. No doubt it is a true cause, and must have some influence, but the question is whether it is the secondary or the primary cause of changes. The Alpine valley system in the main dates from pre-glacial times, and it is almost impossible to ascertain how far the system has been modified by post-glacial changes. I heartily congratulate Sir Martin Conway and Mr. Garwood on their perseverance in returning to the country, and on the valuable results they have brought back.

Sir HENRY HOWORTH, M.P.: I have little to say except to emphasize what has been said so well already. I should like to add, however, that, being a member of Parliament, I have been delighted at the number of graceful adjectives these gentlemen have at command. In regard to the theoretical part of the issue raised by my friend Prof. Bonney and my friend Sir Martin Conway, there is this advantage—that what they have had to put forward is at all events consistent with the laws of physics and with the laws of ice-movement. Occasionally we have had to deal with some terrible theories which have been consistent with neither. The first paper I ever read in my life was when I was seventeen, when I read a paper before this Society on the areas of land that are rising round the two poles, which I mapped out and showed to be fairly continuous. One of the interesting points about Spitsbergen is this—that the evidence shows plainly that very recently the Spitsbergen archipelago has risen from the sea to a very considerable extent, and in that way its climate has been altered very much for the worse. Baron Nordenskiöld showed me some wonderful post-Tertiary shells he had found in Spitsbergen, and pointed out that those shells are not found in Spitsbergen now, but prevail in Southern Norway. This is another strong proof of the same fact. Just as the case of Greenland, where we have the same recent change in climate attested by the fact of the land having risen in the first place, and secondly by the occurrence of similar shells. Possibly the most arctic conditions that ever existed in these islands are not in periods that have gone by long ago, but in the current period; and that while we were suffering from tremendous glaciers in the old days, it would appear—and that is the view of more than one recent Danish explorer in Greenland—that the climate and the temperature were very much more moderate than they are at present in these high latitudes. I must, in conclusion, again repeat how delighted we have all been, both at the graceful discourse and the photographs, and I would say, that if ever I travel in these regions, there is no person other than my wife with whom I would rather travel than with one or other of these two graceful persons.

The CHAIRMAN: I think, at this late hour of the evening, it is almost time to close the meeting. I therefore ask you to allow me to return thanks to Sir Martin Conway for his eloquent lecture. We must all admire the way in which he attacked Spitsbergen, and he has brought the results of his journey before us in a very pleasant manner. I hope you will allow me to include in the vote of thanks Mr. Garwood, whose photographs have given us better pictures of the country than we have ever seen before; in fact, I think they are amongst the best photographs of arctic scenery that I have ever seen at the Society's lectures.

MR. FRAZER'S PAUSANIAS.*

By the Rev. H. F. TOZER.

A NEW edition of Pausanias' 'Description of Greece,' in which that work should be illustrated by the light which modern discovery has thrown on the subjects with which it deals, has long been a *desideratum* among scholars and classical archæologists, but the greatness of the task has hitherto discouraged the boldest spirits from attempting it. For Pausanias' book is in its way unique in literature. Nowhere else can we find so complete an account of an ancient country, especially in respect of the buildings and works of art which it contained. And the period at which it was composed was eminently suitable for such a task, for at no time, in all probability, had the monuments of Greece been so numerous and in so good preservation as they were in the middle of the second century of our era when Pausanias wrote. In places, indeed, decay had then already begun, but this was compensated by the work of restoration which shortly before that date had been promoted by the Emperor Hadrian. But, in addition to remarkable industry in observing these objects, and carefulness in noting down their details, Pausanias was possessed by an extraordinary curiosity concerning the legends and superstitious beliefs which were attached both to the sacred relics preserved in the temples and to natural features of the ground, such as fountains and groves; and stories connected with these are of constant occurrence in his narrative. Now, in respect of both the subjects by which the old archæologist was thus attracted, an extraordinary advance in knowledge has been made during the last half-century. This has been pre-eminently the age of excavation in Greece, so that, in the course of it, one after another of the most famous ancient sites in that country have been exposed to view, and it has thus been possible to verify the statements of Pausanias on the spot, through the discovery of the buildings and statues which he saw, or of inscriptions relating to them. Again, during this period there has been a remarkable development of the study of folklore, and of the branches of anthropology which are akin to it; so that in numerous instances the portents and marvellous stories which Pausanias records can be paralleled by tales and customs which have been discovered in distant parts of the world, and, instead of being regarded as mere curiosities, can, to some extent, be classified. It is clear that the competent editor of Pausanias should be one who is well versed in both the studies which have just been mentioned.

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* Pausanias' 'Description of Greece.' Translated with a commentary, by J. G. Frazer. In six volumes. London: Macmillan & Co. 1898.

Such an editor has been found in Mr. Frazer, and the six handsome volumes which compose the present edition furnish ample evidence of his competency for the task. The first of these contains Mr. Frazer's introduction, and his translation of Pausanias' work, by means of which it is brought within the reach of other than classical students; and with the same object in view Mr. Frazer has avoided the use of technical phraseology in his notes, as far as is compatible with a scientific treatment of his subject. The English of the translation is clear and good, and, when the style of Pausanias admits of it—as, for instance, in the history of the Messenian wars—it rises to more than average excellence. The last volume comprises the two indexes, the larger of which, a very complete one, is devoted to the work itself, the smaller to the notes. The four intermediate volumes contain Mr. Frazer's commentary, which is his most important contribution to the subject. In this the statements of Pausanias are throughout made the starting-points for discussions of theories and for the introduction of fresh information; but to describe it as a body of notes explanatory of that author would give an entirely erroneous view of its contents, especially as regards its archæological side. In reality, it contains a full account of the discoveries that have been made in Greece up to the present time, together with summaries of the views which have been held concerning the identification of localities and buildings and works of art. The labour which this task represents is enormous, and its value to the student is correspondingly great, because the material from which the information is drawn is largely to be found in foreign periodicals and books in various languages, many of which are not easily accessible. Mr. Frazer has also shown great penetration and a well-balanced judgment in deciding between the conflicting opinions, to which, as might be expected, these discoveries have given birth. In addition to this, he has himself travelled extensively in Greece, and has described a large number of the most important sites from his own observation; by which means the notices of the localities mentioned are rendered more lifelike, and the severity of the scientific treatment of the subject is modified by the introduction of personal impressions. Mr. Frazer's learning is not less conspicuous in those parts of his commentary which deal with folklore, a study with which he had previously shown himself thoroughly conversant in his book, 'The Golden Bough.'

It is no easy matter to give the reader even an approximate idea of the contents of a work of such magnitude as this; it must suffice, by way of illustration, to mention a few instances of what is to be found in it under various heads. As might be expected, the largest amount of space has been devoted to those places where excavations have been carried out on the greatest scale. Thus to Olympia, the ruins of which were laid bare at the expense of the German Government, 153 pages are allotted; and this allowance does not appear excessive, when we consider that Pausanias devoted the greater part of two out of his ten books to that place. It includes also Prof. Treu's restorations of the gables of the temple of Zeus, and Mr. Stuart Jones's conjectural reproduction of the chest of Cypselus from Pausanias' description. To Delphi, the scene of the latest operations of the French School of Athens, 151 pages are assigned; and in this part will be found an account of the serpent column that supported the tripod commemorative of the battle of Platæa, which was dedicated at Delphi, but was removed thence by Constantine the Great to Constantinople, where the column is still standing in the Atmeidan, or hippodrome. In like manner, the work of the British School at Megalopolis, that of the American School at the Heræum of Argos, and that of the Greek Archæological Society at Eleusis, and at the Hieron of Epidaurus, receive their due share of attention. Mycenæ, too, is well described, and the important questions connected with it—the date and origin of the Mycenæan civilization, the relation which it bore to that which is described in the Homeric poems, and the race to which the Mycenæan people belonged—are discussed with excellent judgment. Mr. Frazer's opinion is that the Mycenæan art was of native development on the shores of the Ægean, though certain elements in it came from Egypt and Syria; that the forms of that civilization which are found in Crete represent an earlier, the Argolic forms a later, stage in its development; and that the Homeric period was somewhat posterior to that which is represented at Mycenæ.

As regards the geographical features of Greece, perhaps the most important notices which are met with in this work are those which treat of the underground passages, which form the only outlets of the water that collects in many of the inland valleys of that country. The most remarkable instance of this phenomenon is found in the basin of the Copaic lake, and this is especially interesting at the present time, because that piece of water has quite recently been drained by the construction of artificial passages to carry off its waters, and the area which it previously covered is now a cultivable plain. Mr. Frazer has given us an account, mainly derived from his own observation, both of the modern system of drainage by which this change has been effected, and of similar attempts which were made in antiquity, for of these latter conspicuous traces remain. The corresponding features which are found in the lakes of Pheneus and Stymphalus in Arcadia, and the periodical disappearances of those pieces of water arising from the opening of the subterranean passages which drain them, are also interestingly described. An equal tribute of praise must be given to the discussions of the arguments relating to certain localities which are disputed at the present day. Conspicuous among these is the question of the position of the fountain of Enneacrunus at Athens. Pausanias' description of this has long been a standing puzzle, for he evidently conceived of it as lying in the valley between the hills of the Pnyx and the Areopagus; and Dr. Dörpfeld, who has recently excavated this neighbourhood, has with great, though somewhat over-subtle, ingenuity maintained the correctness of this view. Mr. Frazer, however, is so strongly impressed with the waterless character of this site, and with the almost unanimous testimony of ancient writers in favour of the traditional position of that fountain in the neighbourhood of the bed of the Ilissus, that he decides unhesitatingly against his author and his modern champion. In respect of another disputed point in Athenian topography—the position of the river Eridanus—Mr. Frazer is at one with Dr. Dörpfeld. This stream has usually been identified with the one which rises at the monastery of Kæsariani, on the side of Mount Hymettus, and joins the Ilissus on its left bank, and this view was still maintained by Ernst Curtius in his latest work, 'Stadtgeschichte von Athen' (1891). But Dr. Dörpfeld, relying on the statements of ancient writers concerning the objects which are in its neighbourhood, and especially on the remark of Callimachus, that in his time its water was so foul that cattle would not drink of it, concludes that the Eridanus flowed from the south-western slopes of Mount Lycabettus, and passed through the northern part of Athens, in doing which it would easily be converted into a public sewer; and these arguments appear to Mr. Frazer to be conclusive.

The maps and plans which accompany these volumes are of great service in elucidating the text, and the numerous illustrations will be invaluable to students of Greek sculpture. Altogether, Mr. Frazer is to be congratulated on having produced a monumental work, which is a storehouse of learning and research.

PROPOSAL FOR AN EXPEDITION TO SANNIKOFF LAND.

By Baron E. von TOLL.

On the oldest map of the New Siberia islands, dating from the year 1811, the outlines of two lands are marked, and they bear the inscription, "Land sighted by Sannikoff." One of these stretches on the map from the meridian of the northern point of the Fadeyev island to the longitude of the "High Cape" of the New Siberia island, while the other is marked in the north-west of the island Kotelnyi.

Jacob Sannikoff was a Yakutsk merchant,* who undertook a series of bold journeys to the New Siberia islands from 1805 to 1811, and was first a *promyshlennik* (hunter) in the service of Syrovatski, who had then the monopoly of exploitation of mammoth-tusks in the Liakhov islands; later on he accompanied Mathias Hedenström in his journeys. Sannikoff was one of the discoverers of the New Siberia islands, and we are indebted to him for some very important information concerning the peculiar nature of the islands, which information was transmitted to the world through Hedenström's writings. The first, although unsatisfactory, topographical survey of the islands was made by the topographer Pshenitsyn. Sannikoff was also the first to spend a full summer on the northern island of the New Siberia archipelago. During that stay, he had the opportunity of sighting with his sharp eyes, on clear summer days, those two lands situated the north of the islands, Kotelnyi, Fadeyev and New Siberia, and their supposed outlines were marked on the above-mentioned map according to his indications. His and Hedenström's attempts to reach those lands in sledges drawn by dogs were, however, unsuccessful, because open spaces amidst the ice (*polynias*) soon compelled both explorers to return.

Ten years after the completion of the Hedenström and Sannikoff's journeys, the Imperial Russian Ministry of the Navy sent out the well-known expedition of Lieut. Anjou, which had to settle the topography of the New Siberia Islands, as well as the question relative to the existence of the lands sighted by Sannikoff. After two unsuccessful attempts, made in 1821 and 1822, to overcome with dog-sledges the obstacles offered by the *torosses* (ice-heaps) and *polynias*, Lieut. Anjou declared, in a report addressed to the authorities in 1822, that he was ready to renew the attempt in a boat, starting from the island Kotelnyi, or Fadeyev, but that it was impossible to attain those lands in dog-sledges. However, his proposal was not accepted, on account of the considerable danger which it offered, and Anjou returned in 1823, after having made his last sledge-journey along the coasts of the New Siberia Islands, with the full conviction that, "within the distance which could be attained with the means at hand, there was no land in the north of the islands, Kotelnyi, Fadeyev, and New Siberia."

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* More correctly a burger (*myeschanin*) of Zyryan origin, as his descendants said.

On the authority of Anjou, the "lands sighted by Sannikoff" disappeared from the maps, until full sixty years later, *i.e.* in 1881, the tragical expedition of De Long confirmed, by the discovery of Bennet Land, the existence of the land sighted by Sannikoff from the "High Cape" of New Siberia. This discovery gave support to the idea that the other land, which Sannikoff saw from the Kotelnyi island, but of the existence of which Anjou was doubtful, was not merely an optical mistake, and consequently a dotted shore-line reappeared on the maps, with the name of "Sannikoff Land." *

In the mean time, the tradition about the existence of the land that Sannikoff saw in the north of Kotelnyi island was maintained amidst the *promyshlenniki* (hunters), because those of them who had visited the Kotelnyi island confirmed Sannikoff's statements. In reality, I could convince myself of the exactitude of this affirmation in 1886, during the expedition which was sent out by the Imperial Academy of Sciences, under the leadership of Dr. A. Bunge. On August 13th I saw, during quite clear weather, from the mouth of the Mogur river ("Sannikoff river" on Anjou's map), under 79° N. lat. and 139° E. long., in the direction N. 14° to 18° E.,† the sharp outlines of four truncated cones like table mountains, from which a low foreland extended towards the east. At that time I had no possibility of making an attempt to reach that land. A solid ice-crust seemed to stretch from Kotelnyi island to Sannikoff Land. Perhaps the *polynia* was at that time closed by floating ice, or it opens only during the cold season and after strong storms. At any rate, in order to cover the distance of about 200 kilometres (130 miles) to Sannikoff Land, both dog-sledges and a good boat would have been required, while I had at my disposal only ten worn-out reindeer, with which I had undertaken to make the round of the island. I was bound to return southwards to my headquarters, the winter hut at Uranalakh, where my dogs recovered their forces for the return journey to the mainland. True that a boat had been made there in the mean time out of driftwood, with the aid of a keel and ribs which had been brought from the mainland. But, "uneven-bowed and leaky" as that boat was, it could only be used on August 23 to 25 for a few trips along the coast amidst the ice-floes; it was impossible then to think of a dash towards Sannikoff Land.

In the year 1893 I once more put my foot on the Kotelnyi island, during a rapidly organized excursion, which lasted from May 2 to June 8, and which I made on dog-sledges, but having no boat with me. My main working field was at that time further west, on the Anábar. While I was there, in August and September, the *Fram* sailed along the coast of Siberia towards the New Siberia islands, and passed by Sannikoff Land. Fridtjof Nansen's diary has, under the date of September 20, the following inscription: "We now held (in lat. 77° 44′ N.) north-west along the edge of the ice. It seemed to me as if there might be land at no great distance; we saw a remarkable number of birds of various kinds. A flock of snipes or wading birds met us, followed us for a time, and then took their way south. They were probably on their passage from some land to the north of us. We could see nothing, as the fog lay persistently over the ice. Again, later, we saw flocks of small snipe, indicating the possible proximity of land. Next day the weather was clearer, but still there was no land in sight. We were now a good way north of the spot where Baron von Toll has mapped the south coast of Sannikoff Land, but in about the same longitude. So it is probably only a small island, and in any case cannot extend far north" ('Farthest North,' I. p. 203).

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* This was done, first, at the proposal made by A. Grigoriev, in his paper, "Sannikoff Land," in connection with the discovery of the expedition of the *Jeannette* (*Izvestia* of the Russian Geogr. Soc., vol. xviii. (1882), fasc. 4, pp. 264–267); also Fr. Schmidt, "Remarks concerning Nordenskjöld's 'Circumnavigation of Asia on board the *Vega*,'" in *Beiträge zur Kenntniss des Russischen Reiches*, II. series, vol. vi. (1883), pp. 355–356.

† Anjou determined the position of the mouth of Sannikoff river as 76° 2′ 3″ and 136° 33′ E. of Paris. His magnetical constants are 16° 40′ E. and 82° 57·7′. Consequently, the mountains of Sannikoff Land ought to have been marked on the map due north of the northern extremity of Kotelnyi island.

It appears to me, from Nansen's words, that in his opinion the *Fram* was on that day on the north of Sannikoff Land, and that the birds which he saw were returning from some other unknown land. I believe, however, that the flocks of snipes must have been flying from Sannikoff Land, and that the *Fram* probably was at that moment south of that land. I myself am, to some extent, the cause of that mistake—if mistake there is—because Nansen based himself on my preliminary sketch-map, upon which I had roughly traced the southern extremity of Sannikoff Land in the year 1887. I think, however, for reasons which will be better understood from the following, that in reality Sannikoff Land is situated further north than where I had traced it on the said sketch-map. If it be so, the considerations which made Nansen conclude that that land is but a small island are removed.

The mountains of Sannikoff Land, which I saw through the telescope, very much reminded me by their shapes of the basalt cones of the Svyatoi Nos, as they appear to the eye from the southern shore of the great Liakhov island. The forms of the mountains of the Sannikoff Land thus authorize us to believe that these mountains consist of basalts, like the mountains of Bennet island, the southern point of which (Cape Emma) is said to consist of the same rock, according to the diary of De Long. As to the distance between Sannikoff Land and the Kotelnyi island, we may estimate it as follows:—

When we take into account that the height of the trap, or basalt mountains, in Arctic Siberia altogether is subject to but small oscillations, and, at any rate, seldom exceeds 1200 feet, and that the mountains of the Svyatoi Nos, looked at from the south coast of the Liakhov island, at a distance of about 45 miles, appear to be twice or thrice as high as the mountains of Sannikoff Land, we may conclude that the distance between Kotelnyi and Sannikoff Land is twice or thrice as great as the above—that is, from 100 to 125 miles, or from 1½ to 2 degrees. I conclude, accordingly, that the south coast of Sannikoff Land must be located under about the 78th degree of northern latitude.

As to the probable extension of Sannikoff Land, and the question whether there are to be expected other islands besides those which have been discovered by De Long,—the Bennet, Henrietta, and Jeannette islands—we have, in my opinion, some established points, which permit us to express, with due caution, the following suppositions:—

1. It must be remembered that the traps, which have a wide extension in Siberia, always appear in massives not far apart from each other. Their distribution answers to certain tectonic lines, along which they pierce the sedimentary rocks, whether the latter, being horizontal, build up plateaus, or whether they take the shape of folded series of parallel ridges. The trap mountains are volcanic mantles which spread over the sedimentary deposits; occasionally they have maintained the forms of volcanoes with well-determined craters. Bennet island seems also

to contain, besides the basalts, beds of lignite, which may be considered with great probability as a continuation of the tertiary lignite beds of New Siberia which appear under the same longitude, and are known as the "Wood mountains." The similarity of structure between New Siberia and Bennet island is thus evident, and it is permissible to suppose that Sannikoff Land and Bennet island represent only parts of a trap region having a certain extension.

2. De Long found on Bennet island the antlers of a reindeer, about which he was not certain whether they belonged to a recent or to a fossil individual. In the first case, we could admit either that Bennet island has such a climate as permits reindeer to sojourn there—which would naturally seem highly improbable—or we should be bound to admit that the antlers belonged to an animal which came from New Siberia, and would have been killed in the island, which also seems to me a rather forced explanation. But if these antlers were fossil, then the other contemporaries of the reindeer, the mammoth, the rhinoceros, the musk-ox, etc., whose remains are so characteristic of the New Siberia islands, must also have lived in Bennet island. We should then expect to find in Bennet island and Sannikoff Land the same geological features as in New Siberia. Further, we should then have to conclude that the coast-line of the Post-pliocene Siberian continent not only included the New Siberia islands—which has been firmly established by the two last expeditions of the Academy of Science—but that this old coast-line must be traced still further northwards. How far this old continent—which, like New Siberia, is now broken into an archipelago—stretched northwards, and whether it ended at the spot where Nansen found, in 79° N. lat. and 140° E. long., a depth of 1050 feet, or whether it stretched further to the north and the north-east of the course of the *Fram*, is precisely a most interesting geographical question.

3. One of the results of Nansen's *Fram* expedition is the highly important fact that the drift of the *Fram* was not a continuation of the drift of the *Jeannette*, but, although both had the same origin, the latter was to the north of the former.* What is there producing this bifurcation of the current? I cannot answer this question otherwise than by the supposition that there are lands lying in the north of the New Siberia islands, which lands need not stretch, of course, as far as the pole, but must have a sufficient size to produce the said bifurcation of the current.

4. In the drift course of the *Fram*, as well as along the route followed by Nansen and Johansen, it appeared that floating ice always drifted with a greater facility northwards, while it was mostly blocked when it was pushed south-eastwards—that is, in the direction of the archipelago which I suspect to exist.

If these considerations relative to the probable extension of Sannikoff Land and its belonging to an undiscovered archipelago be true, the whole matter is, of course, only about such masses of land as may have the size of Franz Josef's Land, but hardly the size of Spitsbergen or Greenland. *But even if the archipelago consisted only of Bennet island and Sannikoff Land, the urgency, from a scientific point of view, of an exploration of these two islands would not be smaller than if we expected there the presence of larger extensions of land.*

I will mention briefly the scientific aims of an expedition to Sannikoff Land.

It would be needless to bring further proof for the assertion that such an expedition, made with a ship, would have to solve a series of *oceanographic problems*, of which the first would be the investigation of the dependence, so unexpectedly found by Nansen, of the Atlantic ocean on the polar basin.

The *topographical* and *geographical* questions which the expedition would have to solve, are already indicated in what has just been said. It need only be added that the working field of such an expedition would touch part of the unknown, *i.e.* never yet visited polar regions which reach the lowest latitudes in the eastern hemisphere.*

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* Cf. also A. Supan, "Die Norwegische Polarexpedition, 1893-96," in *Petermanns Mitteilungen*, Band. xliii., 1897, pp. 130 *seq.*

Among the physico-geographical researches, *geological* problems stand foremost. Some remarks on this subject have already been made in the exposition of the reasons which make one believe in the existence of an undiscovered archipelago in the north of the New Siberia islands. I will only add what solutions may be found in this region for most important questions relative to the latest periods of the history of our globe.

In the study of the Tertiary sediments which, as already said, must be expected to be found at Cape Emma, on Bennet Island, as a direct continuation of the New Siberia deposits, we meet with one of the most interesting problems, namely, How could sub-tropical plants thrive so near the pole under the present position of the Earth's axis of rotation? It is well known that in Greenland, Grinnell Land, Spitsbergen, and New Siberia, there are Tertiary deposits (Miocene?) which contain impressions of leaves and fruit-cones of several species of *Sequoia*, *Dammara*, and so on, as also large leaves of poplars and other trees which belong partly to a sub-tropical flora. Basing himself upon the words of Schiaparelli, who thinks that astronomy has nothing to object to a change in the position of the Earth's axis of rotation, if geologists prove the necessity of such an admission, Neumayer attempted to explain the, in his opinion, abnormal grouping of the Tertiary floras round the pole by the supposition of the pole having moved since the Tertiary age ten degrees from Northern Asia in the meridian of Ferro. In such case the pole of the Tertiary age would have been situated in the latitude of 80°, where this parallel passes through the archipelago which it is now proposed to explore. However, Nathorst, who has further worked out this theory, thinks that the pole ought to have been situated ten degrees southwards in the direction of North Asia, in which case, what was then the 80th degree of latitude would have passed, as it passed now, through the same archipelago.

The flora of the Tertiary "Wood Mountains" of New Siberia, which is now situated under the 75th degree of latitude, tells, in my opinion, against the theory of Neumayer and Nathorst. But Nathorst remarked that the fossil plants which I brought home in the year 1886, and which represent only fifteen species, are not sufficient to settle the point at issue. In that year I had but a few days for the exploration of the island of New Siberia and its "Wood Mountains," and I had but two dogs to transport my collection, my food supplies, and my baggage. How much better could the Tertiary deposits be explored during a year's stay in Bennet island, and how much more could be collected from the "Wood Mountains" if the collectors had a ship at their disposal for the home journey! I have no doubt that this new expedition would definitively settle the above question.

Another equally important problem is the Quarternary age. The original characteristics of the deposits belonging to that period have long since been explained for Europe and North America by the admission of a wide glaciation during the glacial period. As regards Asia, Prince Kropotkin was till lately alone in maintaining that parts of Asia, and especially middle Siberia, were also glaciated during the Quaternary period; but Northern Asia was considered till quite recently as having not been glaciated at all during the age when the Ice-period prevailed in the two other parts of the globe. Only my observations in the New Siberian islands in the year 1886, and at the mouth of the Anábar in 1893, and the testimony of

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* Cf. A. Supan's 'Map of the Limits of the Unknown Polar Regions,' in *Petermanns Mitteilungen*, Bd. xliii., 1897, p. 15, plate 3rd.

Nansen about moraines and glacial striæ on the Taimyr peninsula gave positive evidence for the acceptance of glaciation in Northern Asia.* However, the observed facts seem to offer certain peculiarities, and to somewhat differ from the well-known traces of glaciation in Europe, so that a strict verification is required in order to levy *all* doubts. On the New Siberia island it is the "rock-ice," or the fossil glaciers as I have described them, which can be considered as the last vestiges of a former glaciation. The points of comparison between these fossil masses of ice and the present glaciers of the arctic regions cannot easily be found—the more so as the latter have been but insufficiently studied. Only the detailed investigations of E. von Drygalski, whose beautiful work has just been published, contain the basis upon which "rock-ice" can be better investigated.

If the rock-ice of New Siberia be a remnant of the old continental glaciation, as Drygalski is also inclined to accept with me, we may expect to find, on the islands farther north, the centre of radiation of that glaciation. A number of observations indicate that the motion of the continental ice-mass must have taken place in the New Siberia islands in a meridional direction. The exploration of the archipelago on the north of New Siberia will show whether this movement was directed from the north or not. Moreover, it will show whether I am right in my supposition that the Quaternary mammals of New Siberia inhabited a continent which had once a wide extension towards the north and the east, possibly being connected with America, and only gradually was cut into an archipelago. The sum total of the geological exploration of that archipelago, in connection with the comparative study of arctic literature of other regions, must finally throw new light upon the question whether the arctic islands altogether, with the exception of the New Siberia islands, which are undoubtedly continental islands—are remains of a broken up continent or not.

Going hand-in-hand with the geological observations, the *zoological* and *botanical* investigations will give further information concerning the just-mentioned question relative to the origin of these islands. It will appear whether their sweet-water fauna and flora are akin to the flora and fauna of the Asiatic continent only, or also contain an admixture of American species, or of such species as are characteristic of all other arctic lands. An equally great interest must be offered by *the study of the marine fauna,* and a still greater interest by the study of *the micro-organisms* in the snow flora and fauna, and especially in the fossil masses of ice.

The *meteorological* observations which would be made at a spot situated as far as possible north of the Siberian coasts would be of the greatest importance. They would give, so to say, a basis for the highly interesting meteorological observations which were made during the drift of the *Fram*, and consequently related, like all other travelling observations, to some new spot nearly every day.

As to the importance and necessity of observations on *terrestrial magnetism*, I permit myself to give, in connection with the subject, the following quotation only:—

"For our knowledge of the magnetic conditions of the Earth, the observations which we may make in the course of ten years cannot be a substitute for those observations which we lose the opportunity to make. What has not been done to-day is lost for ever; and the absence of these data will remain for ever a gap and a hindrance. Later on, but only after a long interval of time, it will, perhaps, be possible some day to reconstitute the present conditions in a theoretical way. But the perfection of the theory, which will be required for that end, will only then be attained when we shall have made for a long time consecutive observations over the whole surface of the Earth." *

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* Subsequently Vysotsky, who explored the lower Ob in 1896, and Inn. Lopatin, in the diary of his journey of 1866, which was only published in 1898, brought further proofs in favour of the glaciation of these regions.

I now will pass from these theoretical considerations to the practical question, *How can Sannikoff Land be reached?* The attempts of Sannikoff in 1806–1811, and of Lieut. Anjou in 1821-1823, have shown that with dog-sledges the land lying in the north of the New Siberia islands cannot be reached, on account of the *polynias* (open spaces). On the other side this can easily be done in summer, in a boat, as has been proved by De Long, on his return journey from Bennet island to New Siberia. However, a serious scientific exploration of those lands would be impossible under such conditions. For science' sake, it would be necessary to winter on Sannikoff Land, and in such case the shipping of the necessary provisions on sledges or in boats would evidently be impossible.

The only appropriate way to reach Sannikoff Land would be to make the passage in a ship—from the mouth of Lena, as will presently be shown. As might have been expected, the *Fram* expedition has proved that it is possible to attain the latitude of 78°—that is, the latitude of Sannikoff Land—in a few days by simply following the ice-free drift of the waters of the Lena.† True that in this latitude the *Fram* was frozen, and the famous drift of the unconquerable ship began therefrom. But it must not be forgotten that the *Fram* was very much belated, and that it was frozen on September 25. To avoid such an issue, which would be quite undesirable, it is evident that the journey should be made earlier in the season, and this can only be accomplished with certainty if the ship starts from the mouth of the Lena. That this last is quite free of ice in August is proved, besides many other testimonies, by my boat journey in the delta of the Lena in the year 1893.

There would also be another reason for taking the mouth of the Lena as the starting-point for an expedition to Sannikoff Land; namely, the possibility of providing the explorers with the necessary number of dogs, and the provisions for them. The best draught dogs in Siberia, and in the whole world, are found in the delta of the Lena. So that, if it were intended to reach Sannikoff Land in the course of one summer by starting from a European port, it would still be necessary to call at the mouth of the Lena to take the dogs, or at least (for the sake of saving time) at the mouth of the Olenek, where the dogs would have been prepared in advance. It is self-evident that in such case there would be the risk of missing that part of the season which would be best suited for reaching Sannikoff Land. It would thus be necessary, in order to be sure to attain the aim and to be well equipped, to spend two summers—not to mention that the ship which will next sail past Cape Chelyuskin may be less lucky than its three predecessors, the *Vega*, the *Lena*, and the *Fram*—and in such case may be compelled to winter at Cape Chelyuskin, and then spend a third summer on the way.

Consequently, it seems to me that the surest way would be to charter for the expedition a ship which would lie at anchor in the Lena the winter before. The steamer *Lena* is still there, but she is hardly in a state which would allow her to sail in the polar sea. It would thus be necessary to have another new ship. In case the available means would not allow of building or buying a new vessel, it seems to me reasonable to follow the example of the *Lena* of 1878, that is, to send a ship to the mouth of the Lena for purely commercial purposes. Such an enterprise, especially if a customs-free entrance of the goods at Yakutsk be granted, would be without doubt highly profitable; and it hardly would be advisable that such a ship should attempt to return the same summer with a cargo of goods exported from Siberia. Besides, the visit to the mouth of the Lena by a strong ice-resisting ship, under the guidance of an experienced Norwegian walrus-hunting captain, and the experience which would be thus won in the navigation of the Arctic sea in the waters surrounding New Siberia, would be an epoch-making fact. A successful navigation of the New Siberia waters would mean, on the one side, the beginning of a solid scientific exploration, and of a systematic study of the mammoth tusks wealth of these islands; and on the other side, it would be a prelude to the navigation eastwards of the Lena, to the mouth of the Kolyma, which would answer to a most pressing need of the population settled along this river. As an illustration of this need, it may be mentioned that, in consequence of the difficulties of transport by land, along the nearly 670 miles' long road from Yakutsk, across the 5000-feet-high Takulan pass of the Verkhoyansk range, the *pud* (36 lbs.) of rye-flour costs the Government 7 roubles 57 copeks (15*s.* 4*d.*) at Verkhoyansk; and from this last place the flour has to be taken nearly another 670 miles, until it reaches Kolymsk. What is the price of a *pud* of rye-flour at Nijni-Kolymsk, I don't know,* while the price of flour at Verkhoyansk is taken from an official communication which was made to me, in the year 1893, by the governor of the province of Yakutsk. It is evident that if the flour were sent every year on board ship from the mouth of the Lena, along the coast, to the mouth of the Kolyma, as also of the Indigirka, the Government would find in this mode of transport a great benefit.

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* A. Schmidt, "The Geographical Problems of the Exploration of Terrestrial Magnetism," in *Verhandlungen des XII-ten Deutschen Geographentages*, 1897, p. 127.

† The *Fram* passed the mouth of the Olenek on September 15, and on September 20 she was in the supposed latitude of Sannikoff Land.

As for the sale of European goods, if such be shipped from Europe, they would find, first, the Yakutsk market, and then the market of the gold-mines scattered on the large tributaries of the Lena. The returns of the Yakutsk fair, which takes place in summer, from July to the end of August, attain, according to official data, the figure of 2,000,000 roubles (£200,000), of which one-half represents the value of imports—chiefly cotton and woollen goods, china and earthenware, various colonial produce (excepting tea), and different chemical produce, while the other half represents the exports of fur goods and mammoth tusks.

As to the gold-mines, they are situated chiefly on the tributaries of the Vitim and the Olekma, and lately have been spread to those of the Aldan. The administrations of the two former regions spent, in 1889, the sum of 4,174,150 roubles (£417,415) for goods sold to the workers only. As to the needs of the gold-mines for technical purposes, it will be sufficient to name only dynamite, of which about 900 *puds* (about 33,000 lbs.) were used in 1889. It is certain that the orders for goods from one single of the larger gold-mines would be sufficient to richly pay the journey of a steamer *viâ* the polar sea to the mouth of the Lena.

The idea of a navigation between the mouths of the Lena and the Kolyma is so little new that Baron A. E. Nordenskjöld, more than twenty years ago, made the proposal to open a regular navigation between the Lena and Bering strait, and soon after that proved the possibility of realizing his scheme by his *Vega* journey. I was brought to the idea of the Lena and Kolyma navigation partly through my own knowledge of part of these regions, and partly directly by a considerable Siberian export firm, Gromoff & Co., and their representative, M. Pikhtin. This shows that there is already a demand for that navigation. My proposal is certainly not meant to be opposed to Nordenskjöld's plan, but, on the contrary, I consider its realization as equally desirable and practical.

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* According to the testimony of a gold medallist of the Russian Geographical Society, who stayed at Kolymsk for four years and wrote a book about those regions, signed "Dioneo," the price of a *pud* of rye-flour is 14 roubles 70 copecs (£1 10*s.*). As to salt, its price raises to 1 rouble (2*s.*) the pound in the spring, and none is to be had at any price. All fish is eaten frozen and raw, for want of salt. (*Note of the translator.*)

The *realization of the expedition* would be, in short words, as follows:—

1. Next summer, in 1899, the ship—a good sea-going Norwegian walrus-hunter—ought to try to make its way *viâ* to Kara sea and past Cape Chelyuskin, to the mouth of the Lena. If the ship succeeds, as was the case with the *Lena* in 1878, to make its way through one of the arms of the mouth of the Lena, it must go up the river to Yakutsk, and, after having unloaded its cargo of goods, winter at Yakutsk or above that town in the Lena. If, however, no passage which would be suitable for the draught of the ship could be found in the delta of the Lena, the ship would find a good anchorage on the west coast of the Borkhaya bay. With the establishment of the winter, the goods could be easily carried by reindeer over the usual commercial road, about 67 miles long, and over the 1500-feet-high pass, across the 250-feet-high Kharaulakh mountains, to Bulun on to Lena, and from this depôt they would be carried further on on board the steamer *Lena*.

2. Next summer the expedition would start, after having provided itself at the mouth of the Lena with a number of the best dogs and reindeer, and previously, with a few Yakut ponies and with the necessary provisions for the animals. In August, taking advantage of the favourable Lena drift, the expedition could easily call at the New Siberia islands in order to establish there depôts. Then, judging from the experience of the *Fram*, it could reach the coast of Sannikoff Land in a few days. It would be desirable, if open water permits it, to penetrate as far north as possible, and to stop at one of the farthest northern spots of the discovered archipelago, or at the north end of Bennet island, in case the latter has a greater extension towards the north than Sannikoff Land.

3. Here the expedition would land, and the ship return to the mouth of the Lena. One part of the expedition would begin then the building of the house which they would bring with them, for establishing their winter quarters, and begin at once the meteorological and magnetical observations which would have to be carried on for a full year. In the mean time, the other part of the expedition may carry on the topographical and geological survey of the archipelago, so long as weather permits this to be done. In the spring and the summer the same work would be continued, so long as the ship does not come to take the expedition home.

4. On the return journey it is desirable to enlarge the field of observations by taking some other course, such as along the eastern coast of New Siberia, in which case a landing at the "Wood Mountains" would be most necessary in order to widely explore them and to make collections.

5. As to the composition of the expedition, it would be sufficient for me to have three collaborators,—an astronomer, a meteorologist, and a topographer. Besides, I would choose among the best *promyshlenniki* (hunters) a few Yakuts or Tunguses to act as hunters and dog-drivers.

NOTE BY THE TRANSLATOR.

The translator of Baron Toll's admirable paper asks the author's permission to add the following considerations. If five-and-twenty years ago the necessity of exploring the flora of the Tertiary deposits *as near to the pole as possible* was considered as a weighty argument in favour of arctic exploration, the force of this argument is only the greater now. Four important sets of facts have been brought to bear since upon the solution of the question indicated by Baron Toll. On the one side, it has lately been maintained that the Tertiary vegetation which was discovered in polar regions may not have been so much sub-tropical as it had been supposed to be. But making full allowance for possible exaggeration of the amount of sun-heat (though not of *light*) that would be required by the Tertiary plants to grow in high latitudes, and fully admitting that these plants may have grown in a northern temperate climate, the fact still remains that no imaginable redistributions of seas and sea-currents would account for the growth of even temperate-zone trees and shrubs in those high latitudes, especially when those latitudes were occupied by a large arctic continent. More fossil material from the highest latitudes is therefore required now, even much more than it was required when the remarkable conclusion of Oswald Heer as regards Tertiary vegetation became first known. The great question raised by Heer—and there is no other question of equal importance in the whole domain of Tertiary and Quaternary geology—will remain unsettled so long as we have not more fossil Tertiary plants from very high latitudes, in order to determine the true character of the sub-arctic Tertiary flora.

The latest discoveries relative to the changes of position of the Earth's axis of rotation have given new support to the hypothesis mentioned by Baron Toll, according to which hypothesis the pole may have been situated in Tertiary times several degrees southwards from its present position. The curve which the pole has described within the last few years is—we now know—a spiral, not a closed circle. But, with all that, the distribution of the tertiary vegetation round the pole seems to indicate that the climate was warmer in *all* directions from the pole. A change in the position of the axis may thus be insufficient to explain the facts relative to the Tertiary flora when these become known in their totality. We *must* therefore know the Tertiary flora of high latitudes *in its entirety*; otherwise we are bound to float in incertitude amidst the different hypotheses.

A third set of facts which have lately been discovered, especially due to the latest investigations in the southern hemisphere, is the astounding similarity of the Tertiary flora all over the surface of the globe. These researches are far yet from being complete, but already they seem to indicate that during the Tertiary age the distinctions between the different zones of the Earth were not so sharp as they are now; the climate on the surface of the globe seems to have been more equal than it is at the present time. If this be true, if the sharp climatic distinctions which we now see between the different zones did not exist in Tertiary times to the same extent and with the same sharpness as they do exist now, a great question arises; namely, was not that relative uniformity of climate due to a different composition of the atmosphere of our globe? And this question, of highest importance for geology, can only be solved by getting considerable quantities of fossil Tertiary plants from both the arctic and antarctic regions.

And fourth, a new hypothesis, which assumes, indeed, a change in the composition of the atmosphere, has been brought to the front by the great physicist, Arrhenius, and has been further developed by one of the greatest authorities on the recent geological history of the globe, Prof. Chamberlin, of Chicago. According to this hypothesis, the immense change in the climate of the globe, which took place between the Tertiary times and the Glacial period, may have had its cause in an increase of percentage of carbonic acid in our atmosphere. The volcanic eruptions which took place on an immense scale at the close of the Tertiary age in America, and in the arctic regions (and I will add, in the antarctic regions as well, and on the immense Vitim plateau and its border-ridges in Siberia), may have thrown into our atmosphere considerable quantities of carbonic acid; and Arrhenius has shown that even a very small addition of this gas to the atmosphere would considerably reduce its transparency for the heat-rays of the sun. Besides, one is naturally brought to the suggestion that the gases newly discovered in our atmosphere may also have varied in quantity at different geological epochs, the more so, as one of them, helium, is known to appear in a relatively great proportion in the waters of mineral springs, such springs being closely connected with volcanic outbreaks. In short, the variable constitution of the atmosphere may have been the cause of changes of climate all over our globe, and one of the most vital geological questions is now to ascertain what was the real composition of the Tertiary flora, not only in the temperate zone, but especially in the arctic and antarctic regions. What was the extent of change in climate which we are bound to admit?

Let me also add that, since botanists have so well proved lately that the flora of each separate region of the globe is a direct descendant, and bears the stamp of the flora which clothed that same region in Tertiary times, the thorough and full knowledge of the Tertiary flora, in all the parts of the globe, becomes a matter of first importance for the evolutional botanist.

Taking everything into consideration, it is no exaggeration to say that, once there is a hope of discovering new beds of Tertiary plants in Sannikoff Land and Bennet islands, *this hope alone*, apart from all other geographical and oceanographical considerations so well indicated by Baron Toll, *would be a sufficient reason for sending out an expedition for the exploration of these Tertiary deposits.*

The same applies in full, and even much more, to the necessity of sending out an antarctic expedition to explore the Tertiary plants, the presence of which has been indicated by both Carlsen and Borchgrevink.

P. Kropotkin.

RUSSIAN NAVIGATORS IN THE ARCTIC OCEAN IN 1895-96.*

Communicated by Colonel J. **SHOKALSKY**.†

The special expedition organized by the Ministry of Marine in 1894 to explore the estuaries of the Obi and Yenisei and part of the Kara sea, wintered at Yeniseisk, and on the approach of spring was engaged in repairing the vessels—the s.s. *Lieut. Ovtsin* and sailing barge *Lieut. Skuratov*, the former drawing 8½ feet of water.

In the previous year (1894) they had made a successful trial of the coal obtained from the Alexander Nevsky mine, near one of the right tributaries of the Yenisei—the Dudinka, and, finding its quality to be not inferior to that of English coal, decided on making exclusive use of it for the future.

While these preparations were being made, the commander of the expedition, Lieut.-Colonel A. J. Vilkitsky, together with Lieut. K. V. Ivanov, determined by telegraph the difference in longitude between Yeniseisk and Krasnoyarsk, the former serving as the base for the astronomical work of the expedition. Vilkitsky also conducted, in 1894 and 1896, a series of observations with an apparatus of reversible pendulums by Repsold belonging to the Imperial Russian Geographical Society, by whose desire these observations were undertaken.

On June 15 the expedition left the town of Yeniseisk by the river, and on their way down fixed the position of the village of Gelahino, and observed the magnetic elements at this place and at Dudinsk, where they also took pendulum observations. On July 17 they reached the estuary of the river, and entered the sea to the west of Sibiriakov island. Finding, however, the Gulf of Yeniseisk still obstructed by ice, they turned back, and spent a week in surveying the Korsakov group of islands and the south coast of the gulf. They also succeeded in fixing a position on the south coast of Sibiriakov island, and carried out magnetic observations there. On the conclusion of this work, they made a second attempt to enter the open sea near Mateh Saleh, but were once more obliged to retire southwards on account of the ice. They accordingly went to an anchorage at Zverevo, near the entrance to the Gulf of Yeniseisk, situated on the west coast. Here they experienced a storm of three days' duration, and then again put to sea, but were caught in a second storm off Sibiriakov island, which caused them no further damage than the loss of an anchor, though they were in some peril of being wrecked on the sandbanks off this island. On August 9 they resumed their voyage, meeting with two floes of rotten ice drifting northward from Lake bay. Forcing their way through these, they stood towards that part of the peninsula of Mateh Saleh visited the previous year by the *Lieut. Ovtsin.* Finding a depth of only 15 feet near the cape, they went north and then east to get more sea-room. Here they met with a large sandy island, which they rounded by keeping to the 5-fathom limit, having the ice-belt in sight to the northward the whole way. They coasted along this island for 30 miles, fixed its position on the chart, and discovered that its southern extremity, ending in a steep cape, bore a complete resemblance to the land seen and described by Lieut. Schwede of the s.s. *Lieut. Malygin* in 1893.

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* Map, p. 224.

† Colonel Shokalsky, who has obligingly forwarded this report containing data from unpublished sources, and three charts of this northern navigation, corrected according to recent observations, besides the sketch-map alluded to hereafter, is the Secretary of the Physical Section of the Imperial Russian Geographical Society. He was one of the Russian delegates and a Vice-President at the International Geographical Congress held in London in 1895, at which he communicated a paper on the "Maritime Route to Siberia" (see 'Report of the Sixth International Geographical Congress,' p. 239).

They now set their course for Biely island, intending to fix its position, but thick weather and the arduous work they had before them of surveying the almost unknown Gulf of Obi rendered further delay inexpedient; so, without waiting for fair weather, they turned southwards and entered the wide Gulf of Obi, stretching along the meridian for 400 miles. The navigation here was not difficult, the depth throughout being 10 to 12 fathoms, and no ice being met with. While at anchor off Cape Three Points, at the entrance of Tazov bay, they rode out a storm with the loss of only one cable.

Astronomical observations proved that the whole of the east coast of the gulf was incorrectly placed on the chart, and required shifting 40 miles to the westward, while the position of Cape Three Points was incorrect to the extent of 55 miles.

On reaching the southern part of the bay, they attempted to approach the mouth of the river Nyda or Nadim, but found this impossible owing to shallows, the south wind which had blown persistently for three weeks having driven the water to the northward, and lowered the depth on the bar of the Obi. Four days were spent in discovering the channel, and it was August 24 before they entered the so-called Hamanelsky Obi, the northern channel of the delta, having previously fixed the position of Entrance island and Cape Hamanelsky. On August 30 they arrived at Obdorsk after a successful season's navigation in the Arctic ocean and Gulf of Obi.

The results obtained include accurate positions and definitions of the coasts of the Gulf of Yeniseisk, Sibiriakov island, and the east side of the Gulf of Obi; astronomical positions along the rivers Yenisei and Obi; and a continuous series of magnetic observations from Yeniseisk to Port Dickson and along the Obi. It was found that both sides of the Gulf of Yeniseisk, east and west of Sibiriakov island, were equally deep and free from all hidden dangers. The west coast is more sheltered than the east, but not so accessible, except in clear weather, because Sibiriakov island, which has to be passed at a distance of 8 miles, lies low and cannot be sighted in hazy weather, and is, moreover, surrounded by shoals. By going east, navigators may run a straight course from Cape Mateh Saleh to the North-eastern islands, and from these may pass Sibiriakov island in any weather. The North-eastern islands, being about 200 feet above water and very steep, are easily approachable. The island discovered by the expedition to the north of Cape Mateh Saleh may be passed in clear weather at a distance of one or even half a mile; but in fog a more northerly course should be held, in soundings of not less than 7 to 8 fathoms.

Neither is the navigation of the Gulf of Obi dangerous. Keeping the east coast in sight from Cape Droviany, they had even soundings gradually diminishing as they went south, and it is only on the west coast off the Hamanelsky Obi, opposite the Yada, that shoals are frequent. The navigation of this gulf is, moreover, facilitated by the fact of the bottom being soft mud, and only sand on the banks. These too begin gradually, so that when the soil brought up by the lead is gritty, precautionary measures have to be taken. There are no rocks either in the gulf or the river Obi.

The navigation of the Yenisei as far as the town of Yeniseisk showed a depth throughout of 4 fathoms. The channel discovered in 1894 off Cape Gostinny was definitively surveyed in 1895, and found to have a depth of not less than 4 fathoms near Cape Doroféyev. Hence it is superior in every way to the older channel, which has only 15 feet of water, and the Lukovaia arm forms a natural harbour accessible to ocean steamers.

Meteorological and hydrographical observations of tides and currents were systematically undertaken, and a variety of notes and collections relating to natural history, anthropology, etc., were made by Midshipman Botkin, M.D. The length of the seconds pendulum was observed in four places, the northernmost of these being on the North-eastern islands in lat. 73½° (Port Dickson).

In 1896 the expedition left the city of Tobolsk on June 4, and entered the Gulf of Obi on the 24th of this month. By August 11 they had completed their survey of the southern part of this gulf and proceeded northwards; on August 22 they entered Yugor strait, and on September 16 arrived at Archangel.

Descending the Obi, they fixed the positions of the village of Elizarovo, the town of Beriosovsk, and the village of Obdorsk, filled in soundings on existing charts, and corrected shore-lines, changes having taken place at the river-bends owing to spring floods. The lesser Obi was navigated from Beriosovsk, the maps of the greater Obi having been corrected the previous year.

The river entrances were carefully examined, but none were found deeper than 9 feet towards the left coast. Crossing to the right, they ran a line of soundings along the bar, and found a depth of 12 feet under the right coast, all other parts averaging 9 to 10 feet. This proves that vessels drawing 12 feet and upwards cannot enter the Obi. Hence it became necessary to discover a sheltered bay where large steamers might safely discharge their cargoes, and thus secure the importance to commerce of the mighty Obi system. Such a harbour was discovered about 20 miles north of Cape Yam Saleh, with 17 feet of water, only exposed to light rollers with a wind from the opposite right shore. This bay, named "Nahodka" (Discovery) bay, has been surveyed in 1897 by an officer of the hydrographical service specially sent for the purpose.

Having completed their survey of the bar, they sketched in the left coast of the gulf and the southern part of the right coast. Numerous sandbanks were found along the former, but none near the latter. Neither were there serious inaccuracies in former charts to correct, as was the case in the previous year's survey of the east coast. Only here and there was it found necessary to shift the coast-line a little to the west. This result might have been anticipated, owing to the circumstance of the survey of the west coast having been corrected in the second decade of the present century, while that of the right or east coast refers back to the Great North Russia expedition about the year 1730.

In rounding Biely island fog interrupted the survey, and no good positions could be fixed, but the soundings led to the belief that existing charts of this part are fairly accurate.

There is now nothing to hinder this northern navigation, and no systematic survey will have to be undertaken in the future; occasional corrections may be made as the opportunity occurs, and next summer it would be advisable to send an officer overland to examine in detail the bay near the bar of the Obi river.

Four astronomical positions were fixed on the coast of the gulf, besides numerous observations from the deck of the vessel; the position of the church in Yugor strait was also fixed, and the magnetic elements ascertained in seven places. In Tobolsk itself, as well as in Beriozovsk, Obdorsk, and Yugor strait, observations with the pendulum were also made. Meteorological and hydrographical observations were continued every four hours. The weather was altogether unfavourable, and on entering the Kara sea the two vessels, the s.s. *Lieut. Ovtsin* and the barge in tow, were for four days exposed to a violent storm from the north, south-west, south, and north-west, accompanied by fog and rain. The steamer ran short of coal, and had it not been for their adopting the novel expedient of coaling by slinging the sacks on the tow-rope and hauling them by means of a block and pulley from the barge to the steamer, it might have fared badly with them. By dint of incessant exertion on the part of officers and men the furnaces were kept supplied, and the little steamer with her charge weathered the storm.

The incidents of this storm are told by Colonel Shokalsky, but we are obliged, for want of space, to curtail his narrative.

When the weather at last moderated, and they were so fortunate as to enter Yugor shar or strait, one of the steamer's screws was disabled, the stock of coal was reduced to one sack and a half, and the officers and crews of both vessels were in a state of exhaustion. In Yugor strait they met with two English steamers at anchor, waiting the arrival of Captain Wiggins. At the request of the English, they were supplied with the Russian maps, and it was probably due to these (though we are not told so) that these English vessels accomplished their voyage to the Yenisei so satisfactorily—one proceeded up the river, the other discharged cargo and returned safely to Norway. Acts of courtesy such as these deserve to be recorded, because they may help to allay that feeling of irritation which characterizes the relations of their respective governments in other parts of the world.

The sketch-map accompanying this paper is compiled from charts kindly supplied by Colonel Shokalsky.

Besides the above surveys, the *Jigit* cruiser, sent to the Glacial ocean in 1895 to protect the Russian fisheries in those seas, took out officers of the Hydrographical Department—Denisobransky and Jdanko—by whom the following surveys were made:—

1. A sketch-map of—
    - (*a*) The southern part of Pechenga bay (Varanger fiord).
    - (*b*) Cape Sétinsky and Volokov bay at the entrance to Kola bay.
    - (*c*) The southern part of the Kola bay.
    - (*d*) The straits of Kildyn.
    - (*e*) Major station and Voroniye Ludki.
    - (*f*) The southern part of Catherine harbour.
2. Boat soundings of—
    - (*a*) Pechenga bay (Varanger fiord).
    - (*b*) Waida bay.
    - (*c*) Kola bay.
    - (*d*) Teribersky bay.
    - (*e*) Part of the roadstead beyond the Yokan islands.

3. One hundred and seventy-one marine soundings.

4. Two hundred and seventy observations on the temperature and density of the surface water, and twenty-one series at different depths.

5. The entrances to Kola bay and Yokanka were buoyed.

6. Magnetic observations of all three elements at Kolguev island, Matochkin shar, Lesser Karmakul, Mushroom bay, and Catherine harbour.

7. Triangulation of church and station of Karmakul.

8. Astronomical positions of Mushroom bay in Novaya Zemlia and Kolguev island.

This last piece of work gave a particularly interesting result. The observations were made near the mouth of the Goose river on the north-west coast of the island. Its position on Russian charts was lat. 69° 27′ 30″, long. 48° 32′ 0″; on English charts (Imray) the position given is lat. 69° 27′ 30″, long. 48° 43′ 0″, or 11′ east of the position assigned on Russian charts. According to Jdanko, it should be lat. 69° 28′ 56″, long. 48° 51′ 9″, *i.e.* nearly 19′ of arc to the east of the Russian position, and 7′ east of the English.

A third expedition for hydrographic work has now been sent to the Kara sea by the Russian Admiralty, also under the command of Colonel Vilkitsky, on a new steamer, the *Pakhtusoff*, constructed at Middleborough, England.

UNITED STATES DAILY ATMOSPHERIC SURVEY.*

By WILLIS L. MOORE.

The United States Weather Service has been in existence twenty-seven years. During the past twenty-five years the daily synoptic charts of the service have shown the most comprehensive atmospheric survey ever presented to the forecaster, or to the broad investigator of the fundamental principles of storms. The vast region now brought under the dominion of twice-daily synchronous observations embraces an area extending 2000 miles north and south, 3000 miles east and west, and so fortunately located in the interest of the meteorologist as to cut an important arc from the circum-polar thoroughfare of storms of the northern hemisphere. The extreme points of observation are Edmonton, in the Canadian province of Alberta, on the north-west; St. John's, Newfoundland, on the north-east; Key West, on the south-east; and San Diego, on the south-west. And arrangements are now complete for a co-operation with Mexico similar to that in operation with Canada, and which will in a few months extend the area of observation southward over Mexico and Yucatan.

A wonderful panoramic picture of atmospheric conditions is, by the aid of simultaneous measurements and the electro-magnetic telegraph joining the places of observation by a magic touch, thus presented to the trained eye of the forecaster. Each twelve hours the kaleidoscope changes, and a new graphic picture of actual conditions is shown. Where else can the meteorologist find such opportunity to study storms and atmospheric changes?

In the middle of the eighteenth century Franklin detected the rotary and progressive motions of storms; early in the nineteenth century Redfield and Espy contended over rival theories as to the mechanical principle involved in the rotation of storms; and a little later Maury studied the winds of the Atlantic ocean; still later, Loomis, Dové, and Ferrel reviewed these theories and added much to our knowledge; but at this late date no one has been able to satisfactorily co-ordinate the forces operative in cyclones, or to assign quantitative values to the horizontal temperature and pressure gradients, to the surface resistances and internal frictions of convection, to the latent heat of condensation, and to the effect of hemispherical circulation. Probably the only components of cyclonic force that are well understood and accurately computed are the centrifugence and the deflection due to the earth's rotation.

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* Paper read in Section E (Geography) at the Toronto Meeting of the British Association, August, 1897.

Our early investigators studied only the storms of low levels and humid airs, where convection only needed to carry the moist air-currents to a slightly higher elevation, when cooling by expansion produced condensation, and an immediate acceleration of the cyclone by the liberation of latent heat. They had never seen the whirling cyclones of the arid northern Rocky mountain plateau dash down upon our great lakes with rapidly increasing energy, notwithstanding the fact that there was little or no condensation, and hence no addition of the latent heat which Espy supposed was absolutely essential to a continuation of storms.

The great diversity in elevation, topography, temperature, and aridity of the broad region under our observation, constitute conditions unequalled anywhere in the world for the advantages which they present to the physicist to study the mechanical phases of storm development and progression, or, at least, so far as they can be profitably studied by means of observations taken only at the bottom of the great aërial ocean surrounding the Earth.

Here we see summer cyclones formed under the intense insolation which beats down through a cloudless atmosphere upon the arid waste of the Rocky mountain plateau; or winter cyclones, which, if they form in the northern part of the plateau region, move eastward to our lakes, and thence to the St. Lawrence, with scant rainfall; cyclones which, if they have their origin farther south, on the warmer plains of Colorado, move into the Ohio valley, and thence into New England, with considerably more precipitation; and cyclones which, if they have their inception on the high plains of Arizona and New Mexico, can always be expected to give abundant rainfall when they reach the Lower Mississippi valley, and later, as they pass over the Middle Atlantic states. All of these conditions can be studied during their inception at an average altitude of 5000 feet above sea-level, and under conditions of extreme aridity; they can be viewed later, as they come down nearly to sea-level in the Mississippi valley and reach a more humid atmosphere, 1000 miles from the place of their birth; and, finally, they are seen as they reach the extremely humid air of the Atlantic ocean, 1500 miles farther east.

The great winter cyclones, which originate south of the Japanese islands and cross the Pacific ocean, come under our vision as they successfully surmount the formidable Rocky mountain barriers with but little diminution of energy, sweep across our continent with increasing force and heavy precipitation, and, within three days, pass beyond our meteorological horizon at the Atlantic seaboard, only to be heard from three days later as borean ravishers of Northern Europe.

The great anti-cyclones, or high-pressure eddies, which constitute the American cold-waves, drift into our territory from the Canadian North-West Provinces, and, by means of our charts, are studied under rapidly changing conditions during 3000 miles of their course. The high-pressure eddy, with all the convectional principles of the cyclone reversed, may be said not to depend upon the land of its birth for the cold it brings; for a strong vortical and anti-cyclonic motion at the centre is continually drawing down the cold air from above. In the cold wave it must be conceded that the loss of heat by radiation to a cloudless sky is much greater than that dynamically gained by compression, or else it must be assumed that the atmosphere possesses such intense cold at the elevation from which the air is drawn that, notwithstanding the heat gained by compression in its descent, it is still far below the normal temperature at the surface of the Earth.

The West Indian hurricanes, always at sea-level and in humid air, and which are the most violent of all American storms, intrude themselves into the domain of the United States weather-map at the bend of their parabolic course, at about latitude 30°. They have for years furnished a fruitful theme for the thoughts of the investigator.

For twenty-seven years the forecasters of the Weather Bureau have studied the inception, development, and progression of these different classes of atmospheric disturbances. From a knowledge personally gained by many years' service as an official forecaster, I do not hesitate to express the opinion that we long since reached the highest degree of accuracy in the making of forecasts possible to be attained with surface readings. It is patent that we are extremely ignorant of the mechanics of the storm, of the operations of those vast yet subtle forces in free air which give inception to the disturbance, and which supply the energy necessary to continue the same. Long having realized this, I determined at once, on coming to the control of the United States Weather Bureau, to systematically attack the problem of upper-air exploration, with the hope ultimately of being able to construct a daily synoptic weather-chart from simultaneous readings taken in free air at an altitude of not less than 1 mile above the earth. Prof. Marvin was assigned to the difficult task of devising appliances and making instruments, and I am pleased to say that we have improved on kite-flying to such an extent that apparatus is now easily sent up to a height of 1 mile in only a moderate wind. We have made an automatic instrument which, while weighing less than two pounds, will record temperature, pressure, and wind-velocity. By January next we hope to have not less than twenty stations placed between the Rocky mountains and the Atlantic ocean, taking daily readings at an elevation of 1 mile or more.

We shall then construct a chart from the high-level readings obtained at these twenty stations, and study the same in connection with the surface chart made at the same moment; being thus able to map out the vertical gradients of temperature, pressure, and wind-velocity, as well as the horizontal distribution of these forces, it is hoped to better understand the development of storms and cold-waves, and eventually improve the forecasts of their future course, extent, and rate of movement.

In exceptional cases we have flown the kites to a height of 1¾ mile. From daily readings at only one kite station, at Washington, we have derived information as to the force and direction of the wind above the 1-mile level, which has greatly assisted us in estimating the future direction of a storm-centre when our surface chart gave but negative indications. It will be a fascinating study to note the progress of cold-waves at this high level, and to determine if the changes in temperature do not first begin above. The readings at Washington indicate that contending equatorial and polar winds may be more potent in the formation of storm-eddies than heated and ascending convectional currents.

I am anxious to know the difference in temperature between the surface and the upper stratum in the four quadrants of the cyclone and in the four quadrants of the anti-cyclone, especially when the storm and cold-wave conditions are intense. At an elevation of 5 miles but little effect remains of diurnal temperature variation. At this altitude the atmosphere is free from the disturbing influence of immediate surface radiation, and consequently there is but little change between the temperature of midday and midnight. The vertical distribution of temperature in the several quadrants of the cold-wave or rain-storm areas may give a clue to the future direction of the storm—to the little aberrations in direction which cause the forecaster to fail in his predictions for considerable areas. When we are able to construct isobaric gradients at the 1-mile level, it may be discovered that the storm-centre at that elevation will not always coincide with the geographical location of the storm-centre at the surface of the Earth. The displacement of this centre may possibly give some indication of the future direction of the storm. In other words, there are many interesting problems to be solved by this investigation.

PERSIAN GULF NOTES.

KHARAG ISLAND.

By Captain A. W. STIFFE, R.I.M.

A FEW notes on this island may be of interest, there being ancient remains as well as more recent ones of the time of the Dutch settlement. Kharag is 4 miles long, and 3 miles broad at the northern end, being roughly triangular in shape, and lies off the Persian coast 31 miles north-west by west from Bushire.* It is hilly, except the north-east corner, and the ground very broken and rocky. The hills are capped with a thin bed of nearly horizontal calcareous breccia of tertiary age, under which is a great thickness of softer beds, which are being gradually removed by rain and wind, when the upper crust breaks up and falls in large slabs and masses, and presents a curious picture of desolation. The highest part is 284 feet above the sea, and is occupied by a small tomb. The village on the low north-east point is inhabited by fishermen. It was for many years the home of the pilots for the river (the Shat-el-Arab), and all vessels bound to Basrah had to call here for their pilot for the river.

The population at the time of the survey was estimated at 400 men, mostly fishermen, with a few Persian soldiers. Much of the plain and many of the valleys were cultivated, with date plantations and gardens, and there were flocks and herds among the hills. A few antelope were to be found, mostly on the north-west side. There are several short kanâts, or underground channels, to convey water from the hills to the lower ground.

The most ancient of the remains found here, are certain small caverns hollowed out of the soft rock, and coffin-like troughs excavated in the surface of the rock, all apparently for burial-places. The largest of the caves we entered was about 15 feet square, and 8 high inside, the roof being slightly domed. They have been ornamented internally with carved mouldings, and externally, the face of the rock scarped vertically and worked into tracery of pillars and arches, well preserved where not exposed to the weather. The interior of some of them has arched recesses, and has been subdivided by thin vertical partitions of the live rock left when hewing out the caves. In these are horizontal grooves, apparently for sliding shelves, from their size adapted for the reception of the dead. Unfortunately, the vertical party-walls have been in great part destroyed, the caves being used as cattle-pens, but the grooves were still perfect, about 1½ feet apart, and in four tiers.

Of later remains, the principal is a tomb with a spire (sketch) standing behind these caves, higher up the hillside. It is said to be of Mir Muhammad, a son of

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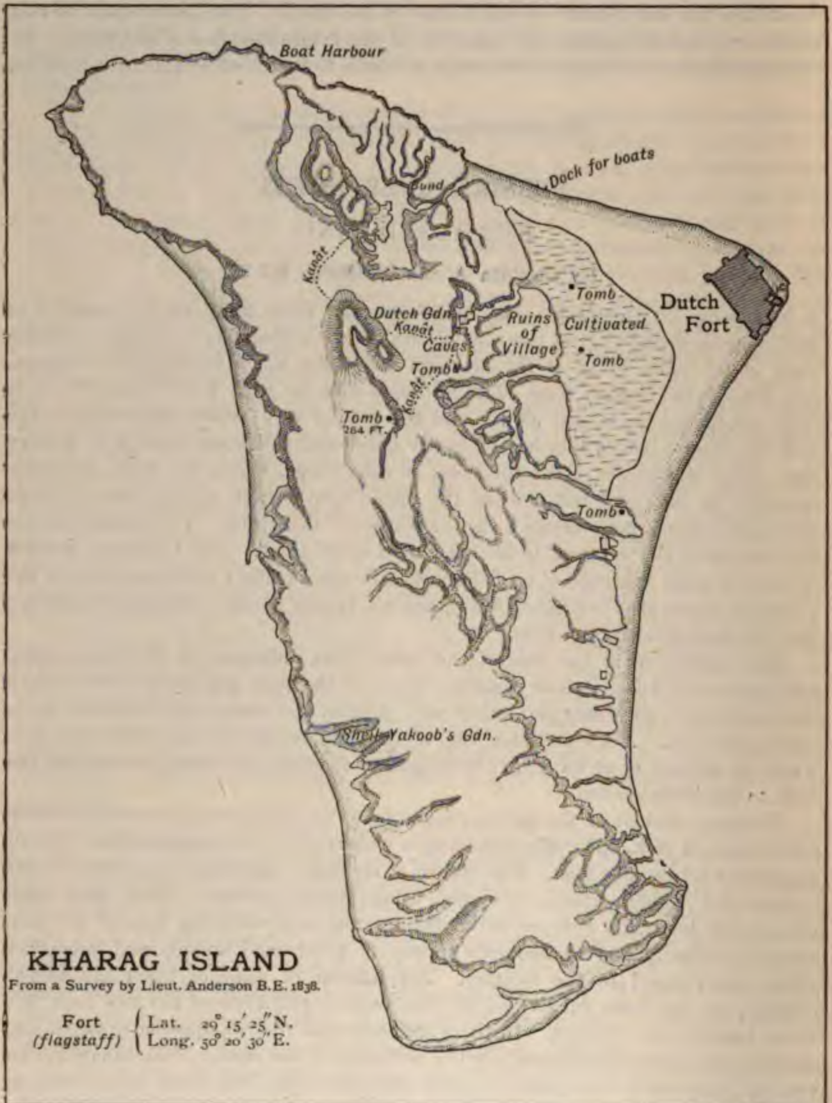
* Properly Abu-Shahar, but the English corruption is so general that it seems impossible now to establish the correct name (see map of island reduced from Lieut. Anderson, R.E.).

Ali, and has an inscription stating it was rebuilt nearly six hundred years ago. It is still a place of pilgrimage.* There are several other shrines; in one is shown a mark in the rock, said to be the impression of the hand of the prophet el-Khizr.



KHARAG ISLAND
From a Survey by Lieut. Anderson B.E. 1838.

Fort (flagstaff) Lat. 29° 15′ 25″ N.
Long. 50° 20′ 30″ E.

Walker & Boutall sc.

There is also a tomb 40 ells in length, called Chehil-gazah, of a saint said by tradition to have been of that stature.

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* The island is referred to as a place of pilgrimage by Yakút, 1218, who visited it on his way to Kis ('Dict. Geogr. de la Perse from Yagout.' By C. Barbier de Meynard. Paris: 1861).

On the low north-east point stands the old fort erected by the Dutch in 1754, after they had abandoned Bandar Abbas, and had been compelled to leave Basrah.* They established themselves here in order to command the trade with that place, and it quickly rose to some importance under its founder, Baron Knyphausen, a man of genius. It encloses a large space of ground within a bastioned wall, now utterly ruinous, except the citadel at the north-east corner which is occupied by a small Persian garrison. Under the Baron's successor, in 1765, it was taken from the Dutch, one account says by treachery, by Mir Muhannah, the pirate chief of

TOMB OF MIR MUHAMMAD.

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* In 1748, during the Afghan invasion of Persia, when their factories were plundered.

Bandar Ríg,* a small port on the main, and they do not seem to have attempted to re-establish themselves either here or at any other place in the gulf.

I do not find any reference to the early history of the place in any of the old geographers, it being only mentioned by name. The British occupied the island as a menace to Persia in 1838–42, and again during the Persian war of 1856–7.

Thevenot† visited the island in 1665, and says there was some trade with Basrah to Bandar Ríg and Ispahán "to avoid custom-house."

AREAS OF NORTH AMERICAN AND AUSTRALIAN RIVER-BASINS.

To the May number of *Petermanns Mitteilungen* Dr. Alois Bludau contributes the concluding instalments of his recalculations of the river-basins of the globe outside of Europe by the method explained in our note on the first instalment in vol. ix. p. 666. As in our former tables at that place, and in vol. xi. pp. 61–63, Dr. Bludau's figures, which are to the nearest multiple of 1000 square kilometres, are here given to the nearest multiple of 500 square miles, which explains some discrepancies between the totals and the sum of the individual items in the tables below, the totals being obtained, not by summation, but by conversion from Dr. Bludau's figures.

NORTH AMERICAN RIVER-BASINS.

A. General Synopsis.

	Sq. miles.
1. Domain of Pacific Ocean...	1,731,500
2. Domain of Arctic Ocean...	2,444,000
3. Domain of Atlantic Ocean	
(*a*) Domain of open sea	992,500
(*b*) Domain of Gulf of Mexico	2,009,500
(*c*) Domain of Caribbean Sea	131,000
4. Regions of inland drainage	393,500
	7,701,500

B. Domain of the Pacific Ocean.

	Sq. miles.
1. Panama to Cape Elena ...	23,000
2. Cape Elena to Tehuantepec	35,000
3. Tehuantepec to Petacalco Bay	28,500
4. Petacalco Bay to San Blas	68,500
5. Rio Grande de Santiago...	50,000
6. Rio de Mesquital ...	19,000
7. Rio de Mesquital to Rio Yaqui	51,500
8. Rio Yaqui and Rio de la Asuncion	68,500
9. Rio Colorado	228,000
10. Rio Colorado to Cape San Lucas	6,000

B. Domain of the Pacific Ocean—*continued.*

	Sq. miles.
11. Cape San Lucas to the boundary of the U.S. ...	17,500
12. Boundary of the U.S. to San Francisco	22,000
13. San Joaquin and Sacramento	48,500
14. San Francisco to the Columbia	40,500
15. Columbia	253,000
16. The Columbia to the Frazer	20,000
17. Frazer	90,000
18. Frazer to Mount St. Elias	123,500
19. Mount St. Elias to the Yukon	197,000
20. Yukon	305,500
21. Yukon to Cape Prince of Wales	25,500
	1,731,500

C. Domain of the Arctic Ocean.

1. Cape Prince of Wales to Mackenzie river ...	160,000
2. Mackenzie...	641,000
3. Mackenzie to Repulse bay	276,000

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* Niebuhr, 'Travels in Arabia in 1762,' refers to this potentate as a "detestable monster."

† 'The Travels of M. de Thevenot into the Levant.' London: 1687. Newly done out of French.

C. Domain of the Arctic Ocean—*continued.*

	Sq. miles.
4. Repulse bay to Churchill river	177,500
5. Churchill	158,500
6. Churchill river to Nelson river	7,500
7. Nelson	417,000
8. Nelson river to Cape Chidley	606,000
	2,444,000

D. Atlantic Domain.

A. Domain of the Open Sea.

1. Cape Chidley to the St. Lawrence	169,000
2. St. Lawrence	482,000
3. St. Lawrence to the St. Croix inclusive	67,500
4. St. Croix to Cape Cod ...	32,000
5. Cape Cod to Sandy Hook	35,000
6. Sandy Hook to Cape Henry (Chesapeake bay) ...	84,500
7. Cape Henry to Charleston	75,500
8. Charleston to the Straits of Florida	47,000
	992,500

B. Domain of the Gulf of Mexico.

9. Straits of Florida to the Mississippi	149,000
10. Mississippi—	
(*a*) Left bank from the mouth to Cairo ...	32,000
(*b*) Ohio	204,500
(*c*) Left bank from Cairo to the source	120,000
(*d*) Right bank from the source to St. Louis ...	84,000
(*e*) Missouri	519,500
(*f*) Arkansas, Red river, and rest of right bank	293,500

D. Atlantic Domain—*continued.*

	Sq. miles.
11. Mississippi to Rio Grande del Norte	193,000
12. Rio Grande del Norte ...	220,000
13. Rio Grande del Norte to Rio Panuco	21,000
14. Panuco	38,000
15. Tampico to Santa Anna (isth. of Tehuantepec) ...	46,500
16. Santa Anna to Laguna de Terminos	62,000
17. Laguna de Terminos to Cape Catoche	25,000
	2,009,500

C. Domain of the Caribbean Sea.

18. Cape Catoche to False cape	74,000
19. False cape to Monkey point (Pta. Gorda)	30,000
20. Monkey point to Ochoa (Greytown)	18,000
21. Ochoa to Colon	9,000
	131,000

E. Regions of Inland Drainage.

1. Great Basin and Mohave desert	208,500
2. Tulare lake	14,500
3. Gila desert south of the Rio Gila...	13,500
4. Colorado desert and interior of Lower California	36,500
5. Sierra Madre plateau ...	34,000
6. Mexico between San Luis Potosi and Rio Grande del Norte	87,000
	393,500

AUSTRALIAN RIVER-BASINS.

A. General Synopsis.

1. Domain of the Pacific Ocean	240,500
2. Domain of the Indian Ocean	1,127,000
3. Regions of Inland Drainage	1,567,500
	2,935,000

B. Domain of the Pacific Ocean.

1. Cape Wilson to Mount Lindsay	67,000
2. Mount Lindsay to Keppel bay	31,000

B. Domain of the Pacific Ocean—*continued.*

3. Fitzroy	54,500
4. Keppel bay to Trinity bay	68,000
5. Trinity bay to Cape York	20,500
	240,500

C. Domain of the Indian Ocean.

A. Cape York to the North-west Cape.

1. Cape York to Melville bay (Gulf of Carpentaria) ...	235,500
2. Melville bay to Roebuck bay	201,000
3. Larrey point to North-west cape	87,500
	524,000

C. Domain of the Indian Ocean—*continued.*

B. North-west Cape to Point D'Entrecasteaux.

	Sq. miles.
4. North-west cape to Steep point	52,000
5. Steep point to Mount Peron (30° S.)	60,000
6. Mount Peron to Point D'Entrecasteaux ...	44,500
	156,500

C. Point D'Entrecasteaux to Cape Wilson.

	Sq. miles.
7. Point D'Entrecasteaux to Wattle camp (Culver point)	23,000
8. Wattle Camp to Point Bell (Denial bay)	8,000
9. Point Bell to Port Augusta (Eyria peninsula) ...	25,500
10. Port Augusta to Murray ...	11,000
11. Murray	351,500
12. Murray river to Cape Wilson	27,000
	446,500

Whole domain of the Indian Ocean, 1,127,000 square miles.

D. Regions of Inland Drainage.

	Sq. miles.
1. Paroo and Bulloo river ...	62,000
2. Lake Eyre basin	417,000
3. Basin of Lakes Torrens and Gairdner	39,500
4. Lake Frome basin ...	45,500
5. Wimmera	34,000
6. Remainder of South and West Australia and Alexandra Land ...	969,000
	1,567,500

THE GLACIERS OF RUSSIA IN 1896.

Owing to the initiative of Prof. Mushketoff, regular observations on the growth and decrease of glaciers in various parts of the Russian empire began to be made a few years ago, and we have now (*Izvestia* of the Russian Geographical Society, 1897, iv.) the results of the measurements and the new discoveries which were made in 1896.

I. The Caucasus.—Thirteen glaciers were visited in the Caucasus: eleven on the northern slope of the Central, the North-Western, and the South-Eastern Caucasus, and two on the southern slope. All thirteen glaciers continued to decrease in length, the averages (some of them based upon eight to ten years' averages) being on the northern slope—15·4 metres for the Central Caucasus, 23·2 for the North-Western Caucasus, and 38·8 for the South-Eastern Caucasus; and 24 to 26 metres on the southern slope. The general averages may be taken as follows: northern slope, 22 metres; southern slope, 25 metres.

Some glaciers which have been measured for the last eight to ten years gave the following results:—

8.	Glacier	Tzeiski, decrease in 10 years	184 metres.
9.	„	Rekomski „ 10 „	95 „
16.	„	Kalaki „ 10 „	160 „
21.	„	Chacha „ 8 „	170 „
24.	„	Khakel (sources of N. Klukhor), decrease in 8 years	192 „
26.	„	Chapchakhi, decrease in 11 years	286 „
33.	„	Khakel (sources of S. Klukhor), decrease in 8 years	264 „
38.	„	Osukako, decrease in 11 years	488 „

On the Kabish glacier the *névé* masses have shown an increase in height of 3·2 metres (1·4 metre since 1895).

Besides, two explorers, N. A. Bush and N. N. Schukin, who were sent out by the Society for botanical investigations, have visited about forty glaciers, several of which were not known before. All the glaciers visited are in a phase of decrease, as was already known from Rossikoff's and Mushketoff's work.

II. TURKESTAN.—MM. Lipskiy and Barschevskiy have discovered in the Hissar range a number of glaciers formerly unsuspected; namely—

1. Glacier of Severtsoff in the Khazret Sultan mountain group; the end of the glacier lies at an altitude of about 10,500 feet.

2. System of Zigdi (affluent of Varzob, tributary of Kafirnagan). The Zigdi range has on its northern slope the glaciers Zigdi, Sangal, and Buzlyuk, all buried in snow.

3. System of Yagnob: (*a*) On the Barzenga river (chief headwaters of the Yagnob) three great glaciers, the largest of which is immense; it has received the name of Count Rostovtseff; its end is at the altitude of 11,200 feet; top, 13,000 feet; nearly all covered with snow. (*b*) Three glaciers belonging to the system of the Sangdarà river; the largest flows towards north-north-east, and its end attains the 12,500-feet level; and (*c*) the small glaciers Rivut, Tavastvin, Karg, and Kavosang in the Zerafshan range, on the right-bank tributaries of the Yagnob.

4. A small glacier, Kalta-kul.

5. Two big glaciers, one of them reaching the 11,000-feet level (Sokoloff's) on the Tash-kuvat, tributary of Sorbo.

6. A group of big glaciers at the headings of the Namrut river (Mushketoff's, Namrut, Dibarar, Galaist, Galagan), having big circuses, and reaching by their lower ends various levels of from 10,500 to 11,500 feet.

7. Several glaciers, one of them a big one, on the Pakshif, Susob, and Kamarau rivers.

8. A group of large glaciers, Muraka.

9. Several glaciers are also mentioned on the upper tributaries of the Kabud.

Summing up the observations of the expedition, M. Lipskiy writes that most glaciers lie on the northern slope, in groups, especially in the upper parts of the Yagnob. They are mostly buried in snow, and most of them are of easy access. Large moraines, which are seen below the ends of the present glaciers, and large accumulations of morainic *débris*, show that all the glaciers are in a phase of decrease.

M. Maslovskiy's photographs of the lower end of the great Zerafshan glacier show that it has decreased since 1881.

III. SIBERIA.—The chief interest belongs to the Altai glaciers of the Byelukha, which were visited in 1896 by Prof. Sapozhnikoff ('In the Altai,' Tomsk, 1897), and have, as it now appears, a much greater extension than they were supposed to possess. Thus, the Katuñ glacier consists of two branches, attaining respectively the lengths of 3½ and 4¾ miles, while it was supposed to be only 1½ mile long. Close by it lies the Black glacier, 2 miles long. They are all fed by the snows of the Byelukha peak, and are quite separate from the Berel glacier, which also consists of two branches, 2 miles, and about 1⅓ mile long. The lower ends of the Altai glaciers attain the 6500-feet level. All the glaciers are now much smaller than they have been once.

Other glaciers have been seen at the sources of the Kapchal, and three new ones were discovered by Dr. Tronoff at the head of the Bukhtarma, namely, the Bukhtarma glacier, consisting of two branches, and reaching the 8000 feet level; the Ukok glacier, 5 miles to the east of the former, and about 1½ mile long; and the Alakha glacier, about 2½ miles long, and reaching the 8000 feet level. All are in decrease, as shown by their large abandoned moraines.

M. Soboleff has made some good photographs of the Katuñ glacier (*Zemlevyedeine*, 1896, part iv.), as also a relief of the Katuñ mountains.

M. Ignatoff (same periodical, 1897, parts i. and ii.) has discovered a new glacier in the Kimas mountains, at the head of the Bukhtarma, in the South Altai range.

THE MONTHLY RECORD.

EUROPE.

Caucasus.—The nineteenth volume of the *Memoirs* of the Caucasian branch of the Russian Geographical Society is full of most valuable papers. The first paper, "The Alpine Plants of Central Caucasus," by M. Akinfieff, is the result of seven years' work. Being unable at present to publish a further instalment of his 'Flora of Central Caucasus' (Kharkoff, 1894), the author now gives a list of the Alpine plants, 270 species, which were found at altitudes of 9000 feet and more. We have next three papers containing geographical descriptions and full statistical data relative to the Zakataly district and the provinces of Stavropol and Terek, as also a historical sketch of the Terek Cossacks and the towns of the Terek province. These four papers are real mines of information, and one of them is accompanied, moreover, by a map of the province of Stavropol (20 miles to an inch), showing the distribution of landed property among the peasants, the Crown, the domains, and private property. N. Vinnikoff gives next two most valuable lists of all trigonometrically determined points in the government of Kutais (446 points) and in the province of Terek (151 points). Their latitudes, longitudes, and altitudes are given, as well as an alphabetical list of the same points for purposes of reference. V.V. Markovich contributes an interesting paper on the forests of Ichkeria (in Daghestan), which well depicts the forests from the forestry point of view, their utilization, and their inhabitants. Colonel Kartseff contributes a paper on the Kurds—their numbers, their geographical distribution, their language, religion, and division into branches, their institutions, and their present conditions. A most valuable map of Kurdistan (33½ miles to the inch), showing the distribution of the Kurds, the Sunnites, the Kizil-bashs, and the Yezids separately, as also the Armenians and Nestorians, accompanies the paper. The most interesting map of this volume is certainly a map of Trans-Caucasia on a large scale, 13 miles to an inch, showing the division of the country into provinces, districts, cantons, and villages, as also, in different colours, the religions of the population in each village. The appendix contains a masterly paper, by N. Y. Dinnik, on the upper parts of the Urushten and Byelaya rivers, accompanied by a map of the region, on the scale of 3½ miles to the inch, and most valuable "Notes on Suanetia," by Raph. Eristoff (111 pages), which deals with the common law of the Suanes, the children's plays, the legends, the demonology, the beliefs and superstitions, the dwellings, and so on. On the whole, this is one of the best volumes of this remarkably good collection. The twentieth volume of the same publication again contains a work of great value. It is occupied entirely by a first instalment of a large work by Colonel V. Y. Lisovskiy, "Transcaucasia." This first instalment contains the physico-geographical description of the country—the mountains and plateaus; the rivers, lowlands, lakes, seas, climate, vegetation, and animals; a sketch of the origin of the Caucasus isthmus, and its mineral resources. An excellent map of the Caucasus, on the scale of 27 miles to the inch, in which special attention seems to have been devoted to orography, accompanies the very valuable work of Colonel Lisovskiy.

Limnological Studies in the Tirol.—Dr. Halbfass has lately contributed to *Globus* (vol. 73, p. 216; vol. 74, p. 18) some notes on recent studies of the lakes of the Tirol, taken chiefly from articles by G. B. Trener and E. C. Battisti in a new Italian serial published at Trient under the name "Tridentum." They relate chiefly to the lake of Terlago, which, as recently examined by the above-mentioned authors, seems in course of extinction, the maximum depth being now only 9·3 metres (30·5 feet), as compared with 13·8 metres (45·2 feet) recorded by

Damian in 1887 (cf. *Journal*, vol. i. p. 351), while other measurements show a similar decrease. This is due to the fact that the loss by the subterranean outlet (the lake lying in a *Karst* region) more than balances the supply of water by streams. It has been proved by the use of fluorescent liquids that the Ischia Podetti, a small stream which empties itself into the Adige, derives its water from a subterranean outlet of the lake. The results of soundings, temperature determinations, etc., are also given by Battisti with regard to the small lakes of the Fersina district, the most noteworthy point being the phenomenon observed in the Lago delle Valle di Fornace and the Lago Santo, of warmer water in the lower layers than at the surface, in spite of the fact that the lakes were frozen over. Battisti's explanation that this is due to hot springs can hardly, Dr. Halbfass thinks, hold good of the former lakes, where the warmer zone takes up the greater part of the lake.

Increase of the Po Delta during the Nineteenth Century.—Prof. Marinelli discusses the question of the progressive increase of the area of the Po delta in the *Revista Geografica Italiana* (1898, Nos. 1–3). Having, by a comparison of the Austrian map of about 1823 with the result of modern surveys carried out in 1893, arrived at the conclusion that the mean annual increase during those seventy years has been about ·762 sq. kilom. (·293 sq. miles), the author compares this result with those obtained earlier in the century by De Prony and Lombardini, the only observers who had previously studied the question in detail. This comparison leads at first sight to the conclusion that the rate of increase has varied greatly within the period for which data are available, Lombardini's estimate for the interval 1600–1830 having given an annual increase of no less than 1·35 sq. kilom. (·518 sq. miles). Of the causes which might be appealed to as an explanation of such variation, Prof. Marinelli rejects those connected with changes in the amount of rainfall, deforestation, etc. He is more inclined to give weight to such factors as the increased depth of the sea, and its more powerful degrading influence in proportion to the advance of the coast-line, or a possible subsidence, owing to the effects of sedimentation. But an examination of the data on which the estimates respecting the earlier periods are based, shows that no implicit reliance can be placed on these, for a very slight displacement of the position assigned to the coast at an early epoch would materially alter the proportionate increase before and after such date. Taking the mean of the rates of increase given by Lombardini for the periods before and after 1599, a result is obtained which differs but little from that arrived at by Marinelli for the present century, the slight decrease observable in the latter being easily accounted for by the causes above alluded to. The estimated total increase during six centuries amounts to 516 sq. kilom. (198 sq. miles), which means that, by the action of one river alone, Italy has in that period gained no less than $\frac{1}{600}$ of its previous area, while recent surveys show that the increase is actively maintained at the present day. At the end of his article, Prof. Marinelli gives some notes on the length of time which would probably be required to fill up the whole of the Northern Adriatic above 44° 45′ N. lat. The disposition now displayed by the mouths of the Po to bend in the direction of the axis of the gulf introduces a special element of uncertainty, but the writer considers that the time required would certainly exceed 100 centuries, and would probably be more than 120.

ASIA.

Journey in Northern Su-chuan.—A recently issued Consular Report, by Mr. G. J. L. Litton (Miscellaneous Series, No. 457), is of special value, as containing the account of a journey through some of the least-known parts of Northern

Su-chuan, with abundant details on the physical and commercial geography of the country traversed. Mr. Litton's route touched in places those of Count Széchenyi, Mrs. Bishop, and Captain Gill, but for considerable distances it led through entirely new country. Starting from Chungking, the traveller proceeded northwards by the "lesser north road" up the valley of the Kialing river. Beyond Ho Chau, the great treeless sandstone basin of Su-chuan was reached; it is subject to a tremendous heat, and has a poor soil, rice being grown only in the low gullies, yet the population is swarming, every inch of available ground being cultivated. The country to the east of the Kialing was the scene of the famine of 1896–97, and Mr. Litton remarks that these districts are so over-populated that even a slight failure of crops will in future entail widespread distress. The estimate of 50,000,000 for the whole of Su-chuan is, in his opinion, quite a possible one. Beyond Paoning (visited by Mrs. Bishop), the hilly country of North-Eastern Su-chuan, inhabited by a maize and wheat-eating population, begins. Low ranges branch off from the main range which divides Su-chuan from the provinces to the north-east, traversing the country from north-west to south-east, and the country produces little except the teas of Tai Ping and the salt of Ta Ning. At Kwang Yuen, situated on the Kialing, in a hollow among the mountains, the main Peking-Chengtu road, followed in part by Széchenyi, was struck. This place does an important trade with Kansu, a second road leading hence to Chin Chau and Lan Chau. The chief object of commerce is the "water" or Lan Chau tobacco, but fine sheepskins also come down from Chin Chau, one of the most important centres for this trade in China. Fifteen miles west * of Kwang Yuen the Pai Shui or Pi Kau joins the Kialing, and up its valley, hitherto, we believe, undescribed by Europeans, Mr. Litton proceeded. On entering the gorge of Shi Kuan Tsu—the first of a series which extends beyond the market town of Pi Kau, a limestone region is reached; the stream is little more than a mountain torrent, and traffic is carried on chiefly by a rough and narrow track through a wild and thinly peopled region. Pi Kau derives its importance from the medicine trade, standing at the junction of several mountain tracks from the north and west. It is in Kansu, the southern parts of which might, if immigration were encouraged, supply greatly increased quantities of wheat, hides, medicines, etc. Mr. Litton was prevented by illness from making an extended tour into that province, turning instead south-west towards Lung An. Before re-entering Su-chuan, the central mountain range has to be crossed by the Ta Tao Ling pass (6150 feet), the ascent to which is rough and difficult. On the Su-chuan side the cultivation is entirely maize. At Lung An Mr. Litton struck Captain Gill's route, skirting the great mountain system of North-West Su-chuan to Sungpan on the upper Min river, and then proceeding southwards down the valley of the latter. He speaks with enthusiasm of the scenery and the attractions which the country has for the naturalist, and gives useful details of the trade of Sungpan, and the non-Chinese population of its neighbourhood. The mountain region to the south of the Lung An—Sungpan road is inhabited by Chinese or Chinese-speaking Man Tsu. The population is, however, sparse and of recent origin, and large patches of virgin forest still remain. At Mao Chau Gill's route was left, and the south of the hill country crossed by a track leading to Chungpa and the Chengtu road. Here again Mr. Litton was on new ground, and his observations on the country and people are of much value. His report concludes with notes on the Chengtu plain and its irrigation, on the prospects of foreigners in Su-chuan, and on silk production.

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* The direction is given on Kreitner's map (Széchenyi Expedition) as S.S.W.

AFRICA.

Surveys in Buddu, Koki, and Ankole.—In a letter dated Buddu, April 18, 1898, Lieut. Hobart, one of the officers on military duty in Uganda, gives some details respecting surveys carried out by him in the districts to the south-west of that country, accompanied by a map. His routes have intersected Buddu and Koki in all directions, and many minor corrections and additions have resulted. The most important is the insertion of a new Lake, some 14 miles by 3, which drains to the Victoria Nyanza by the Kibale or Kiwale river, just north of the Kagera. The lake lies due north and south, and is named by the natives Kachera, but its discoverer has named it Hobart. A lake, Kanyete or Kachera, was shown by Lugard, who, however, did not visit it, and according to Lieut. Hobart there are two distinct lakes of those names, as well as one named Kajanabátola (Villiers), which means "It comes as you look at it," and refers to the sudden rise and fall of its level, due apparently to subterranean action. Lieut. Hobart says that the Germans have since 1894 occupied the district of Kibumbiro, part of which lies north of 1° south, and therefore properly falls outside their sphere. He urges that the Kagira (Kagera) is the natural boundary of Uganda, and speaks of a current said to set across the Victoria Nyanza from its mouth towards the Victoria Nile. It is known to the natives as Kiira, practically identical with the name of the river.

The Sulphur Springs of Amboni, German East Africa.—In the *Deutsches Kolonialblatt* for May 16, Herr Bornhardt gives a short account of the sulphur springs which have been discovered on the banks of the Sigi, a small river debouching into Tanga bay, and which have been thought capable of utilization as a curative agent. The writer describes the geological features of the neighbourhood, and discusses the probable origin of the springs and the means which might be employed to make use of them for baths. At the point where they occur, the Sigi has cut itself a deep channel through the limestone rock, which ends here as an eastward-facing escarpment. The most copious spring occurs on the left bank at the mouth of the gorge, issuing from a field of piled-up blocks at the foot of the cliff. The level of the river varies considerably, according to the season and the state of the tide, the fresh water being impounded at high tide, though no salt water reaches the spot. The springs are situated at about mean water-level, being completely covered at times. Herr Bornhardt considers that the spring water is collected by the limestone and overlying strata of sandy clay, but is of opinion that the sulphur is obtained from other strata of Jurassic age (marls, clay-slate, etc.), which come to light on a tributary of the Sigi, and have been found to contain concretions of iron pyrites. The broken nature of the limestone formation will render doubtful the success of any efforts to raise the level of the spring-water by dams. At low water, however, it might be utilized at its present level by the excavation of a basin, while at high water it would have to be raised by pumping. A sketch, showing the position of the springs, accompanies the article.

Lieut. Werther's Explorations in German East Africa.—The expedition carried out by Lieut. Werther in 1896–97 to the northern parts of German East Africa, between Masailand and Unyamwezi, has already been briefly alluded to in our pages. The cartographical results have now been published in *Petermanns Mitteilungen* (1898, No. 4) on the scale of 1 : 750,000, accompanied by a general description of the country traversed; and as Lieut. Werther's routes (including those of his former journey in 1893) have intersected the country in all directions, he is able to give, from personal knowledge, a very complete account of its orographical and other features. The Nguru, Usagara, and Rubeho mountains form, in his opinion, a connected system, almost all the streams from which belong to the basin of the Wami. On the east side of the mountains rain falls throughout the year, so that the streams never dry up; but the western side, as is the case with other mountain groups in this region, is much dryer. The Wami or Makata plain to the south has quite a different character from the country to the north, though both often go by the name of steppe. The former is quite level, and is in great part overflowed during the rains, while the latter—the Masai steppe—has an undulating and broken surface largely covered with grass. Another mountain system is that of Irangi, which formed the primary objective of the expedition. Its general direction is north-east, and it is drained by tributaries of the Bubu, which finally loses itself in a salt swamp in the west of Ugogo. The streams have wide sandy beds, dry at the surface except after rain. Further west we come to the long line of escarpment which constitutes the western edge of the great East African trough. The eastern edge seems to be by no means well marked in these latitudes, and the character of a trough is not always preserved. Besides Lake Manyara, a large number of brackish lakes and swamps occur near the foot of the escarpment; one of them, named Balangidda (about 8 miles by 3½), had not been visited by any other European. Their depth even in the rainy season seems hardly ever to exceed 6 feet, whilst in the dry season they leave a crust of salt mixed with soda. In the centre of Ufiome rises the three-peaked Gijeda-sen, apparently an extinct volcano; both the mountain itself and the whole volcanic district round abound in iron. Further south, and closer to the escarpment, lies the old volcano Gijeda-hanang, or Gurui, which Lieut. Werther ascended. It has a vast crater in the form of a horseshoe, the sides of which slope very steeply both outwards and inwards. West of the escarpment lies the high plateau of Turu, Ussure, and Iramba, in great part covered with bush-forest, and to this succeeds the Wembere steppe, a longitudinal depression running from south to north and north-east, and generally bounded by well-marked walls. Besides Lake Nyarasa (the Eiassi of Baumann) in the north, there is an extensive swamp, filled in the rains, towards the south. In about 4° S. lat. the steppe sends out a wide bay to the west, while to the east rise the much-rifted Isanzu mountains. Still another trough occurs between Lakes Nyarasa and Manyara, or Laua-ya-Mueri. This is the depression in which lies Lake Hohenlohe, discovered by Lieut. Werther in 1893, and which proves to be not a circular hollow, as he then thought it. The bordering heights increase in altitude towards the north-east, those on the eastern edge being the higher; they have a heavy rainfall, and some primeval forest occurs in clefts on their sides. In the wooded region between Lakes Hohenlohe and Nyarasa dwell the Watindiga, a hunting tribe.

Explorations in the Congo Basin.—Although no very important discovery remains to be made in the Congo basin, minor additions to our knowledge continue to be made in various parts. The results of some of the latest explorations in the basin of the Kasai and its affluents are embodied in Sheet ix. of M. Wauters' map of the Congo State, given with the *Mouvement Géographique* for April 24 (No. 17, 1898). A short account of the explorations appears in No. 16 of the same journal. Early in 1897, M. Stache explored the lower course of the Loange, which joins the Kasai from the south, a little below the mouth of the Sankuru. Report had it that the stream was inaccessible owing to its sandbanks and violent current, but M. Stache found that the difficulties had been much exaggerated. It is a fine stream with deep water and a mean breadth of 200 to 250 yards, with wider reaches exceeding 600 yards. It has a very rapid current in places, but is navigable for large steamers. Its banks are comparatively high, without forests, but generally sprinkled with wine-palms. The Kancha, which enters the Kasai some 80 miles lower down, flows through low plains, and its waters are black, deep, and easily navigated. The population of its banks seems extremely dense. The sixteenth number of the *Mouvement* also contains the first of a series of articles by Lieut. Gustin, who was attached to Van Kerchhoven's expedition of 1891–93 to the upper Welle, accompanied by a map of that river, on which his various routes are laid down. In the seventeenth number, M. Wauters makes some remarks on the hydrography of the region between the Mobangi and the Shari. On the publication of the results of M. Clozel's journey, M. Wauters expressed a doubt as to the connection of the Wom, discovered by him, with the Shari basin. He now points to a recent exploration by M. Perdrizet, as tending to prove that the Wom is identical with the Ombela, a tributary of the Mobangi. In the *Comptes Rendus* of the Paris Geographical Society, however (1898, p. 241), Dr. Herr, M. Clozel's second in command, contests this theory, pointing out that the Wom, after flowing south-east for a short distance, was found by M. Perdrizet to resume its easterly course, and probably turns to the north after reaching the end of the Kare range, supposed by M. Wauters to form part of the Congo-Shari water-parting. The Ombela, Dr. Herr shows, was found by Porel and Brunache to be quite a small river. Finally, it may be noted that since last September commercial enterprise has been initiated on the Lomami, hitherto the most neglected of the Congo tributaries. Factories have been founded on the lower part of the river by M. Langheld, who reports that the population is far more dense than was previously stated, the natives being of an unusually fine type, and well-disposed to Europeans. A company has been formed to open up the region to trade.

Von Carnap's Expedition from the Cameroons to the Congo.—A letter from Lieut. von Carnap, published in the *Deutsches Kolonialblatt* for May 16, supplements to some extent the account of his journey given by the *Mouvement Géographique* (*Journal*, vol. xi. p. 551). The exact route of the expedition cannot, however, as yet be followed on the map. From Yaunde, Von Carnap made his way first towards the north-east to the town of Yoko, in Southern Tibati, proceeding thence south-east in order to visit the important trade centre of Wuchaba. His further route seems to have led along the upper Sanaga, almost to the latitude of Ngaundere, before again bending southwards. The reason for this northerly *détour* was the difficult nature of the country south-east of Yaunde, which is said to consist of an extensive primeval forest. Even on the route followed great hardships were experienced, the native porters suffering especially from the cold. A little later in the year the south of Adamawa would have been impassable, on account of the amount of water. Hausa caravans traverse this region from Yola in the north, and from French Congo in the east, proceeding by various routes to Yoko and Wuchaba already mentioned. Arrived at the French post of Carnotville, on the Mambere, Lieut. von Carnap sent back the greater part of his force by a more direct route to Yaunde, under sub-officers Staadt and Zampa, while he himself proceeded to the south-east corner of the German territory, at the junction of the Ngoko and Sanga. The Dutch and Belgian trading-stations on the Ngoko lie at present on the right bank, but the chief trade is done with German territory, owing to the immense amount of ivory supplied by the forest region between 2° and 4° N. lat. The supply will probably last for a number of years, but Lieut. von Carnap urges that attention should be paid to rubber, which he observed everywhere in large quantities. Some further details respecting the earlier stages of the expedition appear in the issue of the *Kolonialblatt* for June 15.

AMERICA.

Exploration of the Upper Amazon Tributaries.—Dr. A. Rimbach contributes to the *Zeitschrift* of the Berlin Geographical Society (1897, No. 6) a detailed account of a journey made by him in 1894, accompanied by his brother, Carl Rimbach, to the upper Amazon, for the purpose of studying the physical features, and especially the vegetation, of some of the less known parts of that region. Starting from Cuenca, between the two main chains of the Andes of Ecuador, the travellers first proceeded northward to Riobamba, near the headwaters of the Pastaza, it being their object to descend this little known stream to its confluence with the Marañon. Between the basin of Cuenca and that of Riobamba, the Azuay range (14,700 feet, andesite) had to be crossed, and Dr. Rimbach gives some interesting notes on the character of the vegetation at different altitudes, and on the varying aspect of the Andean ranges visible during the journey. The route to the Marañon *viâ* the Pastaza was used by the missionaries of Quito in De la Condamine's time, and was even followed by Madame Godin in 1769 on her adventurous journey to join her husband, one of the French astronomers who took part in the measurement of the degree in the equatorial regions of South America. It appears to have fallen into disuse of late years, and the path to Canelos, a mission station on the Bobonaza, was so indistinct as to be missed even by Dr. Rimbach's guide, who had often traversed it before. The passage of the eastern cordillera is made by a deep cleft at the northern foot of the volcano of Tunguragua, on the slopes of which the travellers could distinguish the lava stream due to the eruption of 1886. At the village of Baños, within the pass, the travellers found the inhabitants much exercised in mind on account of the Peruvian encroachments, and were taken for spies of that nation. Soon after passing this the vegetation characteristic of the Sierra was replaced by forest, which, however, did not at once assume the moist tropical character typical of the lower regions. The numerous tributaries of the Pastaza mostly emptied themselves into the main stream by waterfalls from small plateaux, which are chosen as the sites of settlements. At Canelos, the travellers were detained some weeks by swelling and ulceration of the feet, due to the long marches through the forest. The route was continued by canoe down the Bobonaza and Pastaza amid incessant rain, which caused the river to rise rapidly, flooding its low-lying banks, and bringing down trunks of trees in dangerous quantities. Below the village of Andoas, at the mouth of the Bobonaza, the banks of the Pastaza were quite uninhabited, except at two spots where Peruvian rubber collectors had settled. One of the Indians of the party having been bitten by a poisonous snake, Dr. Rimbach allowed his escort to return, while he and his brother continued the canoe voyage alone, finally reaching the Marañon, and continuing down that stream to the station of Parinari. A compass survey of the Pastaza was carried out, and its course as given by Dr. Rimbach, differs considerably from that shown on the maps. A sketch of the complete river system of the northern tributaries of the Marañon, based on Dr. Rimbach's observations and inquiries, accompanies the paper. The Marañon, too, was found to be much swollen at the end of May, the chief period of high water lasting from February to May, while a smaller rise takes place in October and November. After exploring the banks of the Samiria, a small stream which enters the Marañon just below Parinari, the travellers proceeded by steamer to Yurimaguas, on the Huallaga, and thence by land to the coast *viâ* Moyobamba, Chachapoyas, and Cajamarca. This route involved the crossing of five high ranges, and gave many opportunities of studying the varying aspects of climate and vegetation in Northern Peru. The forest region which had continued without intermission since the descent from the highlands of Ecuador ceased near Moyobamba, the western slopes of the cordillera east of that place showing a tendency to a xerophytic character. On both branches of the central cordillera the contrast between the moist vegetation of the eastern, and the dry vegetation of the western slopes is most marked, while on both branches of the western or coast cordillera the dry predominates. The peculiar character of this dry vegetation, consisting largely of cacti, was especially noticeable on the sides of the upper Marañon valley. The descent down the heated, waterless, slope occupied nearly a whole day, after the stream had been first sighted.

New Expedition of Dr. Hermann Meyer.—Like his brother, Dr. Hans Meyer, Dr. Hermann Meyer has lately undertaken a new expedition to the scene of his former explorations. It is announced in *Globus* (vol. lxxiv. p. 20) that he is to start during August for South America, where he hopes to explore the Atelchu, one of the Xingu headstreams, discovered by him two years ago. There are still unvisited tribes of Indians on this river, and Dr. Meyer hopes to obtain valuable ethnological results. Three other Europeans are to accompany the traveller.

Sir Martin Conway's Expedition.—Sir Martin Conway has left for Bolivia for the purpose of exploring the high group of the Andes, containing the peaks Illimani and Illampu (Sorate).

AUSTRALASIA AND OCEANIC ISLANDS.

Prof. Haddon's Expedition.—According to news received at Cambridge from Prof. Haddon, the expedition which went out under his leadership to study the anthropology of Torres Straits and other parts of the Eastern Archipelago arrived at Thursday island on April 23. A week later a start was made for Murray island, which was, however, only reached after a week's trying navigation. The expedition took up its quarters on Murray island in a deserted mission house, and work had begun in earnest. Preparations are being made by Rajah Brooke to afford the party every possible assistance on their intended visit to Borneo.

The Island of Rotuma.—Mr. J. Stanley Gardiner in his paper on the "Geology of Rotuma" (*Quarterly Journal of the Geological Society*, vol. liv. part i.), treats at some length on the topography of the island. The author's notes were made during his visit to the island in the months September to December, 1896. The island of Rotuma is situated in lat. 12° 30′ S. and long. 177° 1′ E. It appears to lie on a great submarine plateau which includes the Tongan and Fijian groups, and which has a northward extension of 4° to 5° of latitude, with a depth not greater than 1500 fathoms in a general depth of 2000 to 3000 fathoms. The breadth of this plateau north of, and including Tonga, is about 10°, while in lat. 9° to 13° S., it has a westward extension to join the plateau on which the Santa Cruz and Solomon groups lie. Rotuma consists of two parts joined together by a narrow neck of sand. The eastern end is about 5 miles long by 2½ broad, and the heights of its hills, which are volcanic in character, vary up to 860 feet. On their outer faces, towards the sea, are extensive beach-sand deposits. The western end is very sharply separated from the beach-sand flat at the isthmus by steep cliffs of 70 to 100 feet, surrounding the base of Kugoi, while the same hill continues to the south into Kiliga, but to the north has a sharp drop into a valley, from which Sororoa rises to the height of about 850 feet. A remarkable cavern in the lava of Sol Mafiri, with lava stalactites is described, as also a similar cavern in An Hufhuf. The total annual rainfall of the island is estimated at from 150 to 250 inches. The author is of opinion that Rotuma was first formed of a kind of basaltic rock, such as is found in Kugoi now. This rock he believes to have extended along the whole island as it now runs, but to have been broken up by that great eruption, or series of eruptions, which formed the central U-shaped range of hills of the eastern end. By this eruption he believes that this basaltic rock was in places loosely piled up, and then, by disintegration and admixture with lava, formed the hills and islands of volcanic ash. The last stage is the washing away of these, and the formation of oral-reef and the beach-sand flats.

POLAR REGIONS.

Drift-casks for the Investigation of Polar Currents.—In the *Bulletin* of the Geographical Society of Philadelphia (vol. ii. No. 3), Commodore G. W. Melville, well known from his participation in the ill-fated *Jeannette* expedition, develops his plans for an investigation of the circumpolar currents by means of drift-casks. His proposal is that a number of oaken casks of a special design shall be constructed and set adrift to the north of Bering strait in sets of five. The shape suggested is that of parabolic spindles, conical at the ends, the material to be of sufficient strength to withstand heavy pressures. They would be provided with the ordinary bung-hole and bung, the intention being to place within each a tightly corked bottle for the preservation of records in various languages, giving details regarding the exact position in which the casks were abandoned, and requesting the finder to communicate with the hydrographical office of the country to which he may belong. The first five casks might be set adrift at or near Herald island, and the rest successively to the northward, along the eastern edge of the polar pack, until about lat. 75° N., long 170° W. were reached. A map is added showing the probable lines of drift across the polar basin, one, in Commodore Melville's opinion, probably bending to the east, towards the American archipelago.

Departure of Lieut. Peary's Expedition.—The departure of the *Windward* from New York for the North Polar region took place on July 2. On July 9 the ship reached Cape Breton, where Lieut. Peary had arranged to embark, and at once proceeded to coal. An early start northward was expected to be made, the ice in those regions being reported unusually favourable for the time of year. The *Hope*, with coal and other supplies, had sailed previously, and was to meet the *Windward* in the north of Baffin's bay. In accordance with the programme already made public, Lieut. Peary will probably be landed at Sherard Osborn fiord, the ship then returning home if not caught in the ice. In the case of favourable ice-conditions, however, it is possible that he may steam still farther northward before landing. He hopes to reach the northernmost point of Greenland early in the summer of 1899, and to push on for the pole with a small and compact party during the same season.

Mr. Wellman's Expedition.—Mr. Wellman writes to us from Archangel under date July 4, announcing the immediate departure of his expedition for the north. The *personnel* consists of nine in all, four from America, and five from Norway, whilst eighty-three Siberian dogs have been taken on board. A Reuter telegram from Vardo, dated July 15, announces the return thither of Mr. Wellman after a preliminary cruise to the north, heavy pack-ice having been found to bar the way in 77° N. A renewed start was to be made on the 17th. The unfavourable ice-conditions this summer in the Spitsbergen seas are also referred to in *Globus* (vol. 74, p. 18).

Australasia and Antarctic Exploration.—With a view to arousing interest in antarctic exploration in the Australasian colonies, the Hon. C. C. Bowen, who, as a member of the New Zealand Legislature, was present at the Antarctic Conference held last summer at the Society's rooms, has written an article on the subject, which has been published in the *Press* of Christchurch, New Zealand (May 16, 1898). After recounting the various attempts which have been made within the last ten years to set on foot a British expedition to the Antarctic, and lamenting the apathy shown by the Australasian colonies, Mr. Bowen proceeds to sketch the past history of south polar research, as he believes that ignorance of what has been done so far, and of the important problems awaiting solution, is the real cause of the little interest displayed by the colonial public in the matter. Some effect seems to have been produced already by Mr. Bowen's article, which has been reproduced, in whole or in part, in other colonial papers.

Mr. Borchgrevink on his Expedition to the Antarctic.—At the closing meeting of the session Mr. Borchgrevink spoke a few valedictory words on the eve of his departure for the Antarctic, and gave some details as to the composition and objects of his expedition, the funds for which, as is well known, have been provided by Sir George Newnes. Mr. Borchgrevink is accompanied by a strong scientific staff, including Captain Kolbeck and Mr. Louis Bernacchi as magnetic observers, the latter being also an expert photographer; Herr H. Klövstad, M.D., M.A., of Christiania University, as medical officer; and Messrs. N. Hansen and Hugh Evans as zoologists. His ship, the *Southern Cross*, is commanded by Captain Bernherd Jensen, who has already sailed in the antarctic seas, and there are two mates and a crew of twenty-four. Mr. Borchgrevink expressed his sense of the honour which has devolved upon him in being permitted to continue the work of the illustrious Sir James Clark Ross, and his satisfaction that any prospective results will be achieved under the British flag. He expects to return in 1900.

OBITUARY.

Major-General R. G. Woodthorpe, C.B., R.E.

By Colonel Sir THOMAS HUNGERFORD HOLDICH, R.E., K.C.I.E., C.B.

ROBERT GOSSET WOODTHORPE, second son of Captain John Bolton Woodthorpe, R.N., was born at Purfleet, in Essex, on September 22, 1844, and was educated at Mr. John Taylor's school at Woolwich, preparatory to entering the Royal Military Academy as a cadet. He obtained his commission in the Royal Engineers on June 22, 1865, and very early in his career he elected for service in India. He "heard the East a-calling," as many others have done, and he responded to that call with the service of a lifetime, finishing his career as Deputy Surveyor-General at Calcutta, and taking his last long leave on May 26.

Nature intended Robert Woodthorpe to be one of the world's explorers. He was gifted with a short, square figure and sturdy frame, immense capacity for endurance, and a courage that no combination of difficulties and dangers could depress. Thus, when the Indian Survey Department pointed the way to geographical distinction, he accepted the chance with alacrity, and was speedily drafted off to some of the wildest and most inaccessible districts of the Indian borderland on survey duty.

His first surveys were carried through the Khasia and Naga highlands, and it was here that he found himself face to face with a people so exceptional in their physical characteristics, and so entirely aboriginal in their manners and customs, that he at once fell into the habit, which never after left him, of illustrating his wanderings with his pencil. As an amateur artist he was of far above average capacity, and his pictorial records of the Eastern frontier must be considered unique in value, not only for the extent of them, but for their minute accuracy, and the patient, painstaking care with which comparatively small ethnographical traits and distinctions are preserved in them. It was a life of adventure and danger that he led, even in those early days. He was with Butler when that intrepid officer was killed by a spear launched from the jungle, which was apparently intended for Woodthorpe himself. Indeed, his records of the Khasia survey alone would fill a book with stories of adventure; but survey officers in India have little time for book-writing, and the world hears little about them. In 1871–72 he was called to accompany the Lushai expedition, which was carried through districts much akin to those of the Khasia community. Here again his pencil came freely into play, and of this particular expedition he did publish an account, which is well worth study.* Here, too, he first made the acquaintance of an officer who had been appointed quarter-master general of the force—Colonel Roberts, V.C.—and the friendship thus inaugurated lasted unbroken until Colonel Roberts became commander-in-chief of the Indian army, under a much more imposing title.

Not long after the Lushai expedition (in the late autumn of 1878), the outbreak of war with Afghanistan gave Woodthorpe another opportunity of exhibiting his peculiar qualifications, not only as an explorer and surveyor, but as a hard fighting and determined soldier.

Captain Woodthorpe was placed in charge of the survey party attached to the Kuram column under General Roberts. The geography of Afghanistan was in those days mostly an unravelled mystery, and the art of carrying on a systematic survey with a moving force in the field was an art which was then in its infancy. Woodthorpe effected on the line of the Kuram what Tanner and others accomplished on the Khyber. The field work which fell to him was both incessant and rough, demanding all the physique of a trained mountaineer, added to the skill of a trained triangulator. On one occasion I remember that there was question of reaching the highest peak of the Sufed Koh range (Sikarám) from a position near the Shutar Gardan pass, in time to admit of a day's work with the theodolite before descending again to camp ere night fell, on a short winter's day. The ascent was one of about 7000 feet, four hours were barely sufficient for the observations, and the descent had still to be included in the ten or twelve hours of daylight that was all that could be reckoned on. At the first attempt Woodthorpe was up to time, but his carriers were not; he had found the way up, but they could not follow him. He punished them all for laziness, and started again with the same men a little earlier next day. This time he scored a complete success. In those days he was occasionally accompanied by another enthusiastic mountaineer, one who was kind enough to assist him in keeping the record of his observations. I lately found some pages of his "angle books" signed by "George White, Major 92nd Highlanders." In fulness of time this gallant officer and most capable climber of high places succeeded Lord Roberts as commander-in-chief in India. But Captain Woodthorpe had his turn of fighting too. He was acting as aide-de-camp to General Roberts during the memorable Peiwar Kotal action, when he unwittingly made a most risky mistake. In taking a short cut back to the staff from some remote corner of the field, he jumped straight into an Afghan sungur, under the impression that it was held by our own troops. Fortunately, he was himself wearing our Afghan pugri at the time, and he recognized his error just a second or two before the Afghan defenders recognized the quality of their casual visitor. Those few seconds gave him a few yards' start out of the sungur again; but a shot at close quarters caught him in the back, broke his revolver, travelled round his ribs, and bowled him over as he retired hastily down the hill "like a rabbit," as he said. But he was none the worse for it! He lost his rifle, but recovered it again a few days afterwards, during the general Afghan retreat. His work in the Kuram earned him a brevet majority, and when the second phase of the war broke out after Cavagnari's massacre, he was again to the front on the same line of advance, and under the same general. This time we worked together (I had previously been on the Kandahar line) after we had joined our respective surveys at a point on the Bala Hissar hill, overlooking the city of Kabul. During the memorable winter which followed Woodthorpe and I shared our quarters in the "72nd" gate at Sherpur with a brave soldier (Stratton), who was subsequently killed in action; and it was whilst the siege of Sherpur lasted that I had the opportunity of watching and admiring the unfailing cheeriness and unflagging

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* 'Account of the Lushai Expedition, 1871–72.' Hurst & Blackett.

GENERAL R. G. WOODTHORPE, C.B., R.E.

determination that Woodthorpe evinced in his laudable efforts to "keep things going." Whether they were things professional, theatrical, or social; whether there were amusements to be promoted amongst the men, or conviviality to be shared amongst their officers, Woodthorpe was in the thick of them all.

I have referred to his undaunted pluck. If the quality of courage is one that admits of many varieties, then I can say with confidence that Woodthorpe possessed them all. He was of the stuff that makes V.C. heroes, though he never won that distinction. I watched him once when he was within a measurable distance of it, but on that occasion the race was to the swift, and he just failed to win. It happened thus. I had taken a powerful survey telescope to the top of that Sherpur gateway on which General Roberts was watching the progress of the fighting on the Asmai hills before him. The distance was too great to distinguish the different regiments with the naked eye, but near enough to admit of recognizing individuals with a good telescope. So I reported progress, whilst the general walked up and down the narrow space of the roof. I watched a cloud of skirmishers (72nd and Guides) struggle up the heights held by the enemy, till they appeared on the sky-line, where they broke right and left to clear the ridge. I knew that Woodthorpe was with them, and was certain that he would be in the first flight. On the left, balanced on the very apex of the mountain, was a stone-built sungur, from which the plucky defenders declined to move. I could watch them waiting and reserving their fire to the last, meaning to die (as they did die), every man of them, where they stood. In front of the sungur, flat against the sky-line, was 50 yards or so of open sward; at the end of this a rocky bit of cover. Gradually behind the cover a little band collected, and I waited, with intense expectancy, to see who would be first over the flat and into that sungur. It was a gallant corporal of the 72nd who first broke away from the cover of the rocks. He was speedily followed by a small group, headed by the easily recognized figure of my chum. But he was a second or two too late this time. Corporal Sellar was not to be caught. He reached the foot of the sungur first; and then there appeared on the crest of it a figure which seemed gigantic, as, with flowing robes streaming in the wind, and uplifted arms, he dashed down a heavy stone on to the luckless corporal, and sent him, doubled up in a heap, many yards down the hillside. What followed I did not see; but every Afghan died a soldier's death, whilst Corporal Sellar picked himself up and won a soldier's reward—the Victoria cross. More than once have I discussed this little episode with Woodthorpe, and he admitted that for once he was thoroughly exhausted. During the fighting that took place round Kabul, whilst that never-to-be-forgotten December dragged on, Woodthorpe was always to the front, and once had his clothes torn by a bullet and was again slightly wounded, but he was never ill, and never lost that contagious cheeriness which lightened those gloomy days like sunshine. A well-deserved brevet lieut.-colonelcy rewarded him for his share in the second phase of the Afghan campaign.

There are people who maintain that physical courage in action is a useful idiosyncrasy much to be encouraged amongst soldiers, but that it fails to prove the existence of any moral force of character; so I will add another little story.

Woodthorpe was alone this time—alone and deserted by most of his servants in a pestiferous jungle—when cholera gripped his camp. There was no sustaining excitement now, and he feared cholera personally with a deadly fear. There was no doctor, and he could get no assistance, so he worked by himself amongst his dying coolies; and if he could not stay the terrible enemy, he waited till the end, and then sewed the bodies up in coarse sackcloth *with his own hands*, and buried them. Dead or alive, he would not desert his coolies, and yet it is not too much to say that they were drawn from the scum of Assam. He "funked" the cholera, as he said, and of course he got it. Having got it, he told me that he funked it no longer—and he got over it.

It is impossible to write the life-history of a man whose whole career was one of incident and adventure within the short limits that are suitable to this journal; but I must include an account that has been sent me by Colonel Macgregor, C.B., D.S.O., referring chiefly to Woodthorpe's work on the Assam and Burmese frontier. Colonel MacGregor writes as follows: "Early in 1875 we were associated together in the expedition against the Eastern Nagas, to the south of Jeypore, on the left hand of the Brahmaputra river. These hill men had treacherously attacked a survey party under Captain Badgely and Lieut. Holcombe, killing the latter, and severely injuring the former. In this expedition Woodthorpe was ever to the fore, fighting, reconnoitring, and engineering, and in the taking of the enemy's position at Ninu Niau and Sannoa, was of the greatest assistance to the commander of the expedition (the late General Sir J. M. Nuttall, K.C.B.). I well remember how ready he was to share the contents of his water-bottle with me (when I had finished mine) in many a steep climb, and in this, as in numerous other ways, he showed his unselfishness and kindness of heart. In the cold season of 1883–84 Woodthorpe was employed in the Aka expedition to the north of Tezpur, on the right bank of the Brahmaputra, and was of the greatest service to General R. Sale-Hill, C.B., who acknowledged his indebtedness very handsomely in his despatches. On one occasion I remember seeing Woodthorpe cross over, by himself, the Maj Boreli river by means of an Aka cane cradle bridge in order that he might reconnoitre the opposite bank. It was a most risky thing to do, but "little Woodthorpe" never paused to count the cost before executing any deed of daring. In the Aka expedition I had the pleasure of accompanying him in all his reconnaissances, and we had very exciting experiences. Once (it was New Year's Day) we had two Gurkhas with us, and one had been shot in the neck by an (aconite) poisoned arrow. Woodthorpe scooped out the place with his pocket-knife and sucked the wound, and said, 'We will see the wounded man through the business' (after a hand-grip we heard the Akas yelling in the wood round us, and thought it was nearly 'all up'). Woodthorpe disposed our little party of four behind two trees, and we awaited the expected attack; luckily for us probably, the hill men thought better of it and dispersed. On another occasion Colonel H. St. P. Maxwell, C.S.I. (the political officer), Woodthorpe, and I were ascending a hill in single file, when we heard Akas above us cutting away at the canes and creepers which held together a 'shoot' of rocks. Woodthorpe dashed by me up the mountain-side with the view of stopping the cutting and saving our party, and he succeeded in doing so. In the winter of 1884–85 Woodthorpe explored the country to the south-east of Sadya, in the Upper Assam, and I had the good fortune to accompany him. We followed the course of the Noa Dihing, and then struck across the mountains (where, at an altitude of nearly 10,000 feet, we had to wade through snow), and, descending with four Gurkhas into the fertile valley inhabited by the Bor Kamptis, finally reached the Namkiu (the western branch of the Irrawadi), and Woodthorpe practically settled the much-vexed question of the source of the Irrawadi river (though some of the admirers of the intrepid traveller Prince Henri of Orleans afterwards gave the prince the entire credit of discovering the source, because he had crossed the eastern branch of the river). Woodthorpe's party eventually returned to Assam over the Patkoi range to the north-east of the Hukong valley, after many privations and hardships. Woodthorpe was ever cheery and hearty, and difficulties with him disappeared as if by magic almost as soon as they arose. On one occasion we were 'brought up' sharp by a swollen river running deep and rapid. Under Woodthorpe's supervision, we made a raft of plantain trees with creepers to lash the raft together (the only material available), and crossed over our little party without loss, though the Gurkha soldiers and Khasiâ coolies were weak and faint (having had no food for nearly two days!). Woodthorpe took the raft across himself every trip (only one passenger could go at a time, as the plantain trees were so heavy and sunk more than a foot under water), and, as usual, worked like a Trojan. On another occasion he made us fell a tree across a deep and rushing mountain torrent, and, rigging up a hand-rail of cane, we crossed safely. Once we were very hard up for food, and saw no prospect of obtaining any. Woodthorpe recollected he had a few dynamite cartridges, so he went on a river in a little Berthon boat, and, exploding the cartridges by the aid of some Bickford's fuses, obtained a plentiful supply of fish, and so saved the situation. I could quote very many instances of the skill, readiness, pluck, and resource of my friend, and it gives me now the greatest pleasure to look back upon the happy and exciting times we have had together.

Colonel H. Godwin-Austen, F.R.S., in his paper read before the British Association at Aberdeen in 1885, on Woodthorpe's expedition from Assam to the Irrawadi, said, "Colonel Woodthorpe possesses all the qualifications that make the successful explorer. Great powers of endurance and observation, zeal for his work, brave but cautious, a talented draughtsman, and last, but not least, the tact to make himself liked by the people of the country." Colonel Sir H. Yule, in the discussion that followed the reading of my paper in 1886 on Woodthorpe's expedition before the Royal Geographical Society, said, "I am delighted to hear the testimony which Major Macgregor has borne with regard to his fellow-traveller, Colonel Woodthorpe, an officer with whose remarkable enterprises I have been much impressed for the last seven or eight years. Colonel Woodthorpe has made several remarkable journeys to the north-east of India; but his explorations have not been confined to that region. He has just returned from a journey in the extreme north-west beyond the British frontier, through passes which have never before been trodden by any European (exploration beyond Gilghit with General Sir William Lockhart). Colonel Woodthorpe has been an explorer in the regions of the sources of the Irrawadi and of the Oxus." On the same occasion, General J. T. Walker (late Surveyor-General of India) said, "Colonel Woodthorpe is one of the ablest and best officers in a department which contains many and excellent men."

In 1885–86 he followed the fortunes of an officer (Sir William Lockhart, who will shortly return to India as the third commander-in-chief, whose friendship and regard Woodthorpe had the good fortune to win) in the hazardous opening-up of friendly tribal relations, and the exploration of routes north of Chitral during the progress of the Afghan Boundary Commission under Sir Peter Lumsden. Sir William Lockhart knows well what his services were on that occasion; his patient, untiring devotion to duty as surveyor of the expedition in face of difficulties that would have paralyzed the courage and swamped the endurance of any ordinary man. Years afterwards, under very different circumstances, the opportunity occurred of testing the accuracy of the work so accomplished by more rigorous methods which the general advance of scientific surveys in these regions rendered feasible. I can only say that I have never ceased to marvel at the completeness and thoroughness of Woodthorpe's results, knowing well what he had to face in order to secure them.

On February 15, 1889, he was appointed by Lord Roberts chief of the Intelligence Branch of the Q.M.G.'s Department in India. No better selection could apparently have been made. The Indian Intelligence system is entirely different to that of England. In England, Intelligence officers can always work on the assured basis of sound maps. In India, both sound topography and general ethnological information have first to be secured by the Survey Department before the Intelligence officer can graft his theories thereon; and thus the appointment of a survey officer of Colonel Woodthorpe's experience was entirely *apropos* to the requirements of the office. But the close daily routine of office life was not altogether congenial to his adventurous spirit, and he doubtless grew rather impatient of a system which kept him chained to a desk, and in which (as he said) he was the last officer to learn anything new. Independence of opinion is not always welcome in India, and Woodthorpe's views failed to accord with those of his military superiors. A reduction in the status of the office sent Woodthorpe back to his old love and his old life in the Survey. The change might have been altogether for his happiness, but that he accepted it as a reflection on his official capacity. There is no doubt that it affected him greatly, and to his many friends there certainly seemed to have been a want of appreciation of his brilliant services in the nature of those proceedings by which his retransfer was effected.

In the autumn of last year he was appointed Deputy Surveyor-General, which appointment he retained to the day of his death.

If there was one of his characteristics more than another which appealed to his friends, it was his unfailing spirit of genial good-fellowship. His was a cheeriness which spread in ripples around him, and influenced all who fell within its reach. No man could feel "sorry for himself" long in Woodthorpe's company. Such a spirit as this makes more for the final sum of the world's happiness, perhaps, than many of the arts and graces which adorn it. Not that Woodthorpe was insensible to the arts and graces either, for his love of painting amounted almost to devotion, and his accumulated store of life-illustrations is a legacy of which his family must be proud. But he was essentially a man of warm-hearted impulses, and nothing was too much for his generosity—no sacrifice too great for him to make in the interests of a friend.

The world is the poorer for his loss—as much the poorer as generous, true-hearted spirits like his are rare. What the loss to his relations must be it is not for me to say. Woodthorpe never married. He devoted himself with a single-hearted purpose to the interests of those dear to him, who, less happy than he, were not so well able to help themselves. May he rest in peace! He has left many behind who will ever keep his memory green, for we feel that, "taking him for all in all, we ne'er shall look upon his like again."

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1897-1898.

Afternoon Technical Meeting, Monday, June 27, *at* 4.30 *p.m.*—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

The Paper read was:—

"On a proposed Great Globe on a scale of 1:500,000." By Prof. Elisée Reclus.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By **HUGH ROBERT MILL**, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Sweden—Lake Mälar. *Ymer* (1897): 281–291. **Nerman.**
Några anteckningar om Mälaren och dess vattenstånd. Af Gustaf Nerman.

Sweden—Norrland. **Andersson.**
Den inre omflyttningen. I. Norrland-Akademisk Afhandling . . . af Theophil Andersson. Malmö, 1897. Size 9½ × 6½, pp. 60 and xxv. *Presented by the University of Upsala.*

On the movements of population in Norrland.

Sweden—Upsala. *Meteorolog. Z.* **14** (1897): 393–405. **Westman.**
Die Luftströmungen an der Erdoberfläche zu Upsala, 1891–1895. Von Dr. J. Westman.

On the winds at Upsala, discussed in all the bearings of meteorology.

Switzerland. *Globus* **73** (1898): 277–278. **Halbfass.**
Die Gemeinde Obersaxen, eine deutsche Sprachinsel im romanischen Vorderrheinthal. Von Dr. Halbfass.

Obersaxen is a German-speaking commune in the canton of Graubünden, in the midst of the Romanch-speaking districts.

Switzerland. ——
Les inondations et le reboisement de nos montagnes. La Société des forestiers suisses aux autorités fédérales, cantonales et communales. (Traduction.) Berne: Imp. Michel & Buckler, 1898. Size 9 × 6½, pp. 20. *Illustrations.*

Switzerland. *Rev. G.* **42** (1898): 284–287. **Corcelle.**
Le tunnel du Simplon. Par J. Corcelle.

The effect of the St. Gothard tunnel is said to have been a serious loss to France by the diversion of continental traffic from Marseilles to Genoa. The Simplon tunnel now in progress is anticipated to have a similar result.

Switzerland—Valais. *Rev. Scientifique* **9** (1898): 143–144. **Regnault.**
La langue française dans le Valais. Par M. Félix Regnault.

Turkey and Greece—Boundary. *Deutsche Rundschau G.* **20** (1898): 225–226. ——
Die neue Grenze zwischen der Türkei und Griechenland. *With Map.*

The map is remarkably clear, showing distinctly the areas ceded by Greece to Turkey.

United Kingdom. *J.R. Statistical S.* **61** (1898): 49–82. **Cannan.**

Demographic Statistics of the United Kingdom: their want of Correlation and other Defects. By Edward Cannan, M.A.

This paper deals critically with the movement of populations as expressed in the Registrar-General's returns, the composition of the population by nationality as dealt with in the immigration and emigration returns, and internal migration as dealt with in the census reports.

United Kingdom—England. **Phillimore and Whitear.**

Historical Collections relating to Chiswick. Edited by W. P. W. Phillimore and W. H. Whitear. London: Phillimore & Co., 1897. Size 8½ × 6, pp. 306. *Illustrations and Map.*

This book touches upon the meaning and origin of the place-names in the neighbourhood of Chiswick.

United Kingdom—England. **Reed.**

A Handbook to the Geology of Cambridgeshire, for the use of Students. By F. R. Cowper Reed, M.A. Cambridge: The University Press, 1897. Size 7½ × 5½, pp. xii. and 276. *Sections. Price 7s. 6d. Presented by the Publishers.*

This is an admirable exposition of the geology of the country around Cambridge, prefaced by a short account of the physical geography of the locality, which will be referred to in the Monthly Record.

United Kingdom—England. **Williams, Eliot, Meade-King.**

P.I. Civil Engineers **131** (1898): 14–99.

The Manchester Ship-Canal. By Sir E. L. Williams. *Five Plates.* Ditto: Mersey Estuary Embankments.—Eastham Division. By W. Eliot. Ditto: Mersey Estuary Embankments and other Works.—Runcorn Division. By Sir E. L. Williams. Ditto: Irlam Division. By W. O. E. Meade-King. Discussion and Correspondence on ditto. *Three Cuts.*

United Kingdom—England. **Hay and Fitzmaurice.**

P.I. Civil Engineers **130** (1897): 50–98.

The Blackwall Tunnel. By David Hay and Maurice Fitzmaurice. *With Plans.*

A tunnel to connect Tilbury with Gravesend was commenced in 1798, and one between Limehouse and Rotherhithe in 1805, but both were abandoned. Brunel's brick tunnel under the Thames between Wapping and Rotherhithe was commenced in 1825 and finished in 1842. The only other tunnel beneath the Thames below London Bridge was the Tower sub way, opened in 1869. The Blackwall tunnel Act was obtained in 1887, work was commenced in 1891, and the tunnel from Blackwall to Greenwich, of a total length of 6200 feet (1200 feet of which are under the river), was opened for foot passengers and vehicles in 1897. The tunnel in one place is only 5 feet below the bed of the river. It is lined throughout with white glazed bricks, and lighted by electricity.

United Kingdom—England. **Inglis.**

The "Contour" Road Book of England (Northern Division). A Series of Elevation Plans of the Roads, with Measurements and Descriptive Letterpress. By Harry R. G. Inglis. London: Gall & Inglis, 1897. Size 6½ × 4, pp. xxx. and 240. *Maps and Diagrams. Price 3s. 6d. Presented by the Publishers.*

A clear and serviceable guide to cyclists, showing the "ups and downs" of the principal roads in the north of England. The book is very compact and light, so as to be easily carried in the pocket.

United Kingdom—England. **Graham.**

The English Township. By T. H. B. Graham. From the *Gentleman's Magazine*, March, 1898, pp. 252–268. London: Chatto & Windus. Size 9 × 6.

A note on the district of Ditmarsh, between the Elbe and Eider, followed by a history of the origin of the English townships from the early Teutonic village lands.

United Kingdom—England. *Nineteenth Century* **43** (1898): 431–447. **Jessopp.**

Parish Life in England before the Great Pillage. By the Rev. Dr. A. Jessopp.

United Kingdom—England. *Quarterly J.R. Meteorolog. S.* **24** (1898): 42–50. **Marriott.**

The Rainfall of Seathwaite, Borrowdale, Cumberland. By William Marriott. *With Map and Illustrations.*

A note on this paper was given in the Monthly Record for June, vol. xi. p. 663.

United Kingdom—England. *Quarterly J.R. Meteorolog. S.* **24** (1898): 31–41. **Mossman.**
Daily Values of Non-Instrumental Meteorological Phenomena in London, 1763–1896. By R. C. Mossman. *With Diagrams.*

A note on this paper was given in the Monthly Record for June, vol. xi. p. 662.

United Kingdom—England. *Fortnightly Rev.* **63** (1898): 479–485. **Warren.**
The Westminster "Improvement" Scheme. By E. P. Warren. *With Plan.*

The plan shows the projected rebuilding of part of Westminster, the bill to authorize which has failed to pass the House of Commons.

United Kingdom—Ethnography. *British Assoc. Reports* (1897): 452–512. ———
Ethnographical Survey of the United Kingdom. Fifth Report of the Committee.

This report contains a further report on the Folklore of Galloway by the late Rev. Walter Gregor, reports of the ethnographical surveys in Wigtonshire, Kircudbrightshire, and East Anglia, and anthropometric notes relating to Aberdeen, Banffshire, the isle of Lewis, and Cleckheaton in Yorkshire, concluding with a report on the ethnographic survey of Ireland.

United Kingdom—Food-supply. *Nineteenth Century* **43** (1898): 879–889. **Marston.**
Our Urgent Need of a Reserve of Wheat. By R. B. Marston. *With Diagram.*

United Kingdom—Geology. *T. Edinburgh Geolog. S.* **7** (1897): 203–222. **Goodchild.**
Desert Conditions in Britain. An Address to the Geological Society of Edinburgh, at their Opening Meeting on November 19, 1896. By J. G. Goodchild. *With Plate.*

This was referred to in the Monthly Record for June, vol. xi. p. 662.

United Kingdom—Geological. *British Assoc. Reports* (1897): 298–332. **Watts.**
Photographs of Geological Interest in the United Kingdom.—Eighth Report of the Committee.

The work of this committee has been carried on energetically, 364 new photographs of geological interest having been added within the year 1896–97, and the whole collection, which is preserved in the Jermyn Street Museum, now includes 1751, dealing with the various divisions of the country as follows: England, 1027; Wales, 122; Channel Islands, 14; Isle of Man, 30; Scotland, 166; Ireland, 342; and typical rock structures, 50.

United Kingdom—Ireland. **Gardiner and Reynolds.**
Quarterly J. Geolog. S. **54** (1898): 135–148.
The Bala Beds and Associated Igneous Rocks of Lambay Island, co. Dublin. By C. I. Gardiner and S. H. Reynolds. *With Map and Sections.*

A geological map of Lambay island is given on the scale of 4 inches to the mile.

United Kingdom—Ireland. *T.R. Irish A.* **31** (1897): 23–38. **Coffey.**
Notes on the Prehistoric Cemetery of Loughcrew, with Fasciculus of Photographic Illustrations of the Sepulchral Cairns. By George Coffey.

United Kingdom—Ireland. *P.R. Dublin S.* **8** (1897): 421–431. **Kilroe.**
The Distribution of Drift in Ireland in its relation to Agriculture. By J. R. Kilroe. *With Map.*

United Kingdom—Ireland. *P.R. Dublin S.* **8** (1897): 475–507. **Praeger and Sollas.**
Report of the Committee . . . appointed by the Royal Dublin Society to investigate the recent Bog-flow in Kerry. Drawn up by R. Lloyd Praeger and Prof. Sollas. *With Plates.*

United Kingdom—Meteorology. ———
Report of the Meteorological Council, for the Year ending 31st of March, 1897, to the President and Council of the Royal Society. London: Eyre & Spottiswoode, 1897. Size 10 × 6½, pp. 124. *Map. Price 8d. Presented by the Meteorological Council.*

United Kingdom—Meteorology. ———
Official No. 129. Meteorological Observations at Stations of the Second Order for the Year 1894. With Frontispiece Map. Published by Direction of the Meteorological Council. London: Eyre & Spottiswoode, 1897. Size 12½ × 10, pp. 184. *Price 27s. Presented by the Meteorological Council.*

United Kingdom—Ordnance Survey Maps. ——

Board of Agriculture. Ordnance Survey Maps. I. Copies of Three Contracts entered into by the Board of Agriculture, with the Agents appointed for the Sale of Ordnance Survey Maps in London, Edinburgh, and Dublin. II. Copy of the Conditions upon which Agents are appointed in Provincial Towns. III. List of the Agents appointed in England and Wales, Scotland, and Ireland. IV. List of Post Offices at which Ordnance Survey Maps may be ordered. London: Eyre & Spottiswoode, 1897. Size 13 × 8½, pp. 16. *Price 2d.*

United Kingdom—Scotland. *P.R.S. Edinburgh* **21** (1897): 105-115. **Mossman.**

On the Seasonal Death-rate from Certain Diseases in Edinburgh during the Period 1878–94, with Remarks on the Relation between Weather and Mortality. By R. C. Mossman. *With Plate.*

United Kingdom—Scotland. **White.**

The Flora of Perthshire. By Francis Buchanan W. White. Edited with an Introduction and Life of the Author, a list of his Scientific publications, and an Appendix. By James W. H. Trail. Edinburgh: Printed for the Perthshire Society of Natural Science by W. Blackwood & Sons, 1898. Size 7½ × 5½, pp. lx. and 408. *Portrait and Map. Price 7s. 6d. Presented by the Publishers.*

The geographical part of the late Dr. Buchanan White's discussion of the flora of Perth includes the careful subdivision of that county into natural districts, in each of which the distribution of the indigenous plants could be considered. The book forms an important contribution to the slowly accumulating material for a complete geographical description of the British Islands.

United Kingdom—Scotland. **Mossman.**

T.R.S. Edinburgh **38** (1896): 681–756; **39** (1897): 63–208.

The Meteorology of Edinburgh. Parts i. and ii. By Robert C. Mossman. *With Plates. Presented by the Author.*

This monument of laborious compilation brings together a connected series of carefully discussed statistics of the meteorological conditions of Edinburgh for over one hundred years. Not only are instrumental observations discussed, but such observations as the number of days with rain or snow, the occurrence of thunderstorms, etc., are carefully recorded.

United Kingdom—Scotland. **Burns.**

The Coinage of Scotland. Illustrated from the cabinet of Thomas Coats, Esq., of Ferguslie, and other Collections. By Edward Burns, F.S.A. SCOT. 3 vols. Edinburgh: A. & C. Black, 1887. Size 12½ × 10, pp. (vol. i.) xxiv. and 366; (vol. ii.) xviii. and 556; (vol. iii.) *Plates. Presented by the Family of the late Mr. Coats.*

These splendid volumes describe and figure the finest collection of Scottish coins ever brought together, with specimens from other collections, which make the monograph absolutely complete.

United Kingdom—Scotland. *P.I. Civil Engineers* **130** (1897): 276-297. **Kinipple.**

Greenock Harbour. By W. R. Kinipple. *With Plan.*

An account of new harbour works at Greenock, accompanied by a note on the growth of the port.

United Kingdom—Tide Tables. **Harris and Goalen.**

Tide Tables for the British and Irish Ports for the year 1898; also the times and heights of High Water at full and change for the principal places on the Globe. By Captains H. R. Harris and W. N. Goalen. London: J. D. Potter. Size 10 × 6½, pp. xi. and 262. *Presented by the Hydrographer.*

United Kingdom—Wales. *Quarterly J. Geolog. S.* **54** (1898): 119-134. **Pollen.**

Exploration of Ty Newydd Caves, Tremeirchion, North Wales. By the Rev. G. C. H. Pollen, S.J. *With Plan and Sections.*

ASIA.

Russia—Caucasus. *Mém. Caucasian Sect. Imp. Russian G.S.* **19** (1897): 39-50. ——

Statistical information on Zakataly district, Gov. Elisabethpol, Trans-Caucasus. [In Russian.]

Russia—Caucasus. **Akinfiyeff.**
Mém. Caucasian Sect. Imp. Russian G.S. **19** (1897): 1–37.
Alpine Plants of Central Caucasus. By I. Akinfiyeff. [In Russian.]

A list of plants, the botanical names in Latin, and the range of height in feet.

Russia—Caucasus. **Dinnik.**
Mém. Caucasian Sect. Imp. Russian G.S. **19** (1897): Append. 1–81.
The Provence of Kuban at the sources of the rivers Vrushten and Belaya. By N. Ya. Dinnik. *With Map.* [In Russian.]

Russia—Caucasus. **Eristoff.**
Mém. Caucasian Sect. Imp. Russian G.S. **19** (1897): Append. 2, 1–111.
Notes on Svanetia. By Prince Raphail Davidovich Eristoff. [In Russian.]

Russia—Caucasus. **Kawraisky.**
Die Lachse der Kaukasusländer und ihrer angrenzenden Meere. Von F. F. Kawraisky. 2te Lieferung. Tiflis, 1897. Size 10 × 7, pp. 80. *Plates.*

On the Salmonidæ of the Caucasus. The memoir is in duplicate, Russian and German.

Russia—Caucasus. **Kondratenko.**
Mém. Caucasian Sect. Imp. Russian G.S. **19** (1897): 369–380.
Tables showing the distribution of the population of Trans-Caucasus according to religion. By E. Kondratenko. *With Map and Tables.* [In Russian.]

The map of the distribution of religious forms in the Trans-Caucasus is on the scale of 50 miles to an inch.

Russia—Caucasus. **Markovich.**
Mém. Caucasian Sect. Imp. Russian G.S. **19** (1897): 229–338.
In the forests of Ichkeria, Caucasus. By V. V. Markovich. [In Russian.] *With Illustrations.*

Describes the economic utilization of the forests, and the farming carried on in the district, with illustrations of the implements used.

Russia—Caucasus. *Nineteenth Century* **43** (1898): 717–723. **Napier of Magdala.**
The Caucasus and Tirah: a Retrospect. By the Right Hon. Lord Napier of Magdala.

A comparison of warfare in mountain regions held by independent tribes in different countries.

Russia—Caucasus. **Vinnikoff.**
Mem. Caucasian Sect. Imp. Russian G.S. **19** (1897): 169–194.
List of points in the Caucasus, geographically determined by the military-topographical section of the Caucasus. By N. Vinnikoff. [In Russian.]

The geographical co-ordinates of about 500 determined points are given, and also an alphabetical index of the places.

Russia—Sakhalin. **Dickins.**
A Journal kept in Karafuto. A Paper by Mr. F. Victor Dickins. Read before the Japan Society of London, December 11, 1895. Size 10 × 6½, pp. 30. *Illustrations. Presented by the Translator.*

Russia—Siberia. *Questions Diplomat. et Colon.* **1** (1897): 285–288. ———
L'état actuel du chemin de fer transsibérien, par un ingénieur russe. *With Map.*

Russia—Siberia. **Lopatin.**
I. A. Lopatin. Itinerary of the Turukhansk Expedition in 1866. Discussed by M. N. Miklukho-Maklay. Zapiski, Imperial Russian Geographical Society, General Geography, T. xxviii. No. 2. St. Petersburg, 1897. Size 10 × 7, pp. x. and 192. *Map and Diagrams.* [In Russian.]

On the geological results of the expedition, including a geological map of the Yenesei from Yeneseisk to the sea.

Russia—Siberia. *A travers le Monde, Tour du Monde* **4** (1898): 73–76. **Labbé.**
De Tomsk à Tachkent, l'Instruction publique—les Écoles russes et indigènes—l'Enseignement du français. Par M. Paul Labbé. *With Illustrations.*

On the system of education in South-Western Siberia and Central Asia.

Russia – Siberia. *Iz. Imp. Russian G.S.* 33 (1897): 34–47. **Bogdanovich.**
Letters from the Okhotsk-Kamchatka Expedition. By K. I. Bogdanovich. [In Russian.]

Russia—Siberia. *Tour du Monde* 3 (1897): 577, 589, 601, 613. **Chimkiévitch.**
Chez les Bouriates de l'Amour. Par M. Chimkiévitch. *With Map and Illustrations.*

Russia—Siberia. *Deutsche G. Blätter* 20 (1897): 129–178, 237–257. **Franz.**
Ueber die Möglichkeit einer ständigen Seeverbindung zwischen Europa und West-Sibirien. Von Dr. A. Franz.

An important practical paper dealing with the possibility of establishing permanent profitable sea-trade with Siberia. It takes account not only of the conditions of the route, but also of the resources and commercial prospects of Siberia. The paper is fortified by about 130 references to authoritative memoirs.

Russia—Siberia. *Yezhegodnik Imp. Russian G.S.* 7 (1897): 1–34. **Koversky.**
Sketch of the various Geodetic Works connected with the Construction of the Great Siberian Railway. By E. A. Koversky. [In Russian.]

Russia—Siberia. **Krahmer.**
Sibirien und die grosse Sibirische Eisenbahn. Von G. Krahmer. Leipzig: Zuckschwerdt & Co., 1897. Size 9½ × 6½, pp. vi. and 104. *Map. Price* 3*m.*

Russia—Siberia. *A travers le Monde, Tour du Monde* 4 (1898): 145–148. **Labbé.**
De Tomsk à Tachkent. Par M. Paul Labbé. *With Illustrations.*

Russia—Siberia. **Mostitz.**
Protocol Troitskosavsk-Kyakhta Br. Amur Sect. Imp. Russian G.S. No. 1 (1896): 5–17.
Traces of the Stone Age in the Valley of the River Selenga. By A. Mostitz. [In Russian.]

Russia—Siberia. *Iz. E. Siberian Sect. Imp. Russian G.S.* 28 (1897): 1–24. **Obrucheff.**
Excursion into the Gold-bearing Region of the Rivers Sarna and Ilikta in the western Baikal highlands. V. Obrucheff. *Map.* [In Russian, *résumé* in French.]

Russia —Siberia. **Patkanov.**
Die Irtysch-Ostjaken und ihre Volkspoesie. Von S. Patkanov. 1 Tiel. Ethnographisch-statistische Uebersicht. St. Petersburg, 1897. Size 12 × 8½, pp. viii. and 168. *Presented by the Imperial Academy of Sciences of St. Petersburg.*
A thorough study of the Ostyaks and their country.

Russia—Siberia. *Zemlevedenie* 4 (1897): 128–143. **Selnitzky.**
The Anadyr Region. By A. P. Selnitzky. *Tables.* [In Russian.]

Russia—Siberia. *Zemlevedenie* 3, 1896 (1897): 51–110. **Soboleff.**
The Russian Altai Mountains. By M. Soboleff. *Illustrations.* [In Russian.]

Russia—Siberia. *Deutsche Rundschau G.* 20 (1897): 122-126. **Thiess.**
Handelsfahrten durch das Karische Meer, nach den sibirischen Flüssen Ob und Jenissei. Nach russischen Quellen von F. Thiess.

Russia—Siberia. *Iz Imp. Russian G.S.* 33 (1897): 48–52. **Tronoff.**
The Sources of the River Bukhtorma. By V. Tronoff. *Map.* [In Russian.]

Russia—Siberia *Iz. E. Siberian Sect. Imp. Russian G.S.* 28 (1897): 160–165. **Yokhelson.**
On the Vanished Races of Kolymsk District, Gov. Yakutsk. By V. Yokhelson. [In Russian, *résumé* in German.]

Linguistic studies attempting to solve the problem of a vanished tribe of North-Eastern Siberia known as Anauli, Khodintsi, Shelagi, Omoki, or Kangyenisi.

Russia—Siberia. *B.S.G. Marseille* 21 (1897): 362–373. **Saint-Yves.**
Omsk et le Gouvernement d'Akmolinsk. Par M. G. Saint-Yves.

Russia—Siberia. *Scottish G. Mag.* 14 (1898): 241–254. **Greig.**
A Journey from Kirin, Manchuria, overland to Moscow. By James A. Greig *With Illustrations*

Russia—Siberia. *B. American G.S.* 30 (1898): 135-146. **Howard.**
Some Observations on Prisons in Vladivostock and Sakhalin. By Benjamin Howard.

Russia—Trans-Caspian Railway. *Globus* **73** (1898): 140–144. **Hahn.**
Die transkaspische Eisenbahn bis Tschardschui. Von C. v. Hahn. *With Illustrations.*

Description of a trip along the trans-Caspian line as far as Charjui, with interesting photographs of Geok-Tepe, Askabad, Merv, and Charjui.

Russia—Trans-Caucasia. **Lisovskii.**
Mem. Caucasian Sect. Imp. Russian G.S. **20** (1896): 1–232.
V. Ya. Lisovskii. trans-Caucasia. Part i. [In Russian.] *With Map.*

The first part of a comprehensive general account of trans-Caucasia, treating of the physical geography, with a remarkably clear map of the whole Caucasus region, on the scale of 1 : 100,000.

Russian Asia. *Iz. Imp. Russian G.S.* **33** (1897): 348–355. **Mushketoff.**
Exploration of Russian Glaciers in 1896. By I. V. Mushketoff. [In Russian.]

On the glaciers of the Caucasus, and the mountains of Central Asia and Southern Siberia.

Russian Central Asia. *Contemporary Rev.* **73** (1898): 680–697. **Adler.**
A Bird's-Eye View of the trans-Caspian. By E. N. Adler.

A record of a journey last year on the trans-Caspian railway to Samarcand.

Russian Central Asia. **Konshin.**
Solution of the problem on the ancient course of the Amu-Daria. According to contemporary geological and physico-geographical data. A. M. Konshin. Zapiski, Imperial Russian Geographical Society, General Geography. T. xxxiii. No. 1. St. Petersburg, 1897. Size 10 × 7, pp. 256. *Maps and Plates.* [In Russian.]

This is an elaborate discussion of the present condition of the region between the Murghab on the south, the Aral lake on the north, and the Caspian on the west, of which a geological map is given. The dunes of the desert region are considered incidentally, and some interesting drawings of them are reproduced.

Russian Central Asia. *Oesterreichische Monats. Orient.* **24** (1898): 25–29. **Rein.**
Eine Woche in Samarkand und am Serafschan. Von Prof. Dr. J. Rein.

Russian Turkestan. *Globus* **73** (1898): 268–272. **Vambéry.**
Bilder aus Russisch-Turkestan und Ferghana. Von H. Vambéry. *With Illustrations.*

Siam. **Smyth.**
Five Years in Siam, from 1891 to 1896. By H. Warington Smyth. 2 vols. London: John Murray, 1898. Size 8½ × 5¼, pp. (vol. i.) [16] and 330; (vol. ii.) [10] and 338. *Maps and Illustrations. Price* 24*s. Presented by the Publisher.*

These volumes present in a handsome form the results of Mr. Warington Smyth's numerous adventurous journeys in Siam, which have, in part, already been described in the *Geographical Journal* and the extra publications of the Society. The descriptions of travel are supplemented by general chapters on Siamese history and politics, and by a collection of valuable appendices dealing with commercial statistics, natural phenomena, Siamese music and musical instruments. The book is beautifully illustrated by the author's sketches and from photographs.

Siam. **Young.**
The Kingdom of the Yellow Robe. Being Sketches of the Domestic and Religious Rites and Ceremonies of the Siamese. By Ernest Young. With Illustrations by E. A. Norbury. London: A. Constable & Co., 1898. Size 10 × 7, pp. xiv. and 400. *Price* 15*s. Presented by the Publishers.*

This deals with the people of Siam on the basis of several years' residence in Bangkok and much reading. The life and customs of the people are first considered, then the amusements, the predominant industry of rice-growing, which has a chapter to itself, the laws, and ceremonies for the dying and dead. A very full account is given of the temples and the religion of Siam, and the whole concludes with a chapter devoted to elephants. There are numerous illustrations from photographs and sketches.

Siam. *Imp. and Asiatic Quarterly Rev.* **5** (1898): 145–163. **Gerini.**
Shan and Siam. By Capt. G. E. Gerini.

A controversial discussion of the names *Shan* and *Siam*, and of some points in the history of Siam.

Turkey—Palestine. *Contemporary Rev.* 73 (1898): 706–713. **Prag.**
The Jewish Colonies in Palestine. By Joseph Prag.

The colonization of Palestine by Jewish agriculturists commenced in 1882; now the leading colony at Jaffa has about 500 inhabitants engaged in vine-culture, and there are twenty others, the largest of which is at Zichron Jakob with 2000 settlers, most of them from Eastern Europe.

Turkey—Palestine. **Hornstein.**
Palestine Exploration Fund, Quarterly Statement (1898): 94–103.
A Visit to Kerak and Petra. By Charles Alexander Hornstein. *With Map and Illustrations.*

A journey in 1895, with some admirable photographs of towns and scenery.

Turkey—Palestine. *Palestine Exploration Fund, Q. Statement* (1898): 7–20. **Schick.**
Ramathaim-Zophim—the Home of Samuel the Prophet. By Dr. C. Schick. *With Map.*

Turkey—Syria. *B.S.G. Lyon* 14 (1898): 766–794. **Chevrillon.**
La Syrie (Impressions de Voyages). Par M. Chevrillon.

Turkey—Syria. **Cuinet.**
Syrie, Liban et Palestine. Géographie administrative, statistique, descriptive et raisonnée. Par Vital Cuinet. Fascicule 3. Paris: E. Leroux, 1898. Size 11 × 7½, pp. 301–460. *Map.*

Turkey—Syria. **Birch.**
Palestine Exploration Fund, Quarterly Statement (1898): 110–121.
The Prospect from Pisgah. By Rev. W. F. Birch.

A discussion of the limits of the view from Pisgah.

Turkey—Syria. *A travers le Monde, Tour du Monde* 4 (1898): 41–44. **Parisot.**
Le chemin de fer de Beyrout à Damas et Mzérib. Par J. Parisot. *With Illustrations.*

Turkey—Syria and Palestine. *Zemlevedenie* 3, 1896 (1897): 19–50. **Birkenheim.**
The Present Economic State of Syria and Palestine. By A. M. Birkenheim. [In Russian.]

Western Asia. *J. of T. Victoria I.* 30 (1898): 29–85. **Rassam.**
Biblical Lands, their Topography, Races, Religions, Languages and Customs, Ancient and Modern. By Hormuzd Rassam. *With Map.*

The article deals almost exclusively with the Jews, Armenians, Kurds, and Chaldæans.

AFRICA.

Abyssinia. *Questions Dipl. et Colon.* 4 (1898): 12–19. **De la Genardirère.**
Les Provinces équatoriales d'Éthiopie. Par G. de la Genardière.

Abyssinia. *C. Rd., S.G. Paris* (1898): 137–141. **Darragon and Poncins.**
Éthiopie. Le Sidama, l'Amara, le Konso, etc. Par M. Léon Darragon. *With Map.*
Issas et Adals: Abako. Par Vicomte Edm. de Poncins.

African Travel. *B.S.G. Paris* 19 (1898): 107–133, 109–142. **Foa.**
Séance extraordinaire. Réception de M. Édouard Foa, explorateur dans l'Afrique équatoriale. *With Map.*
Traversée de l'Afrique équatoriale. Du Zambèze au Congo par les grands lacs (Août 1894—Novembre 1897). Par Édouard Foa. Observations astronomiques et magnétiques et altitudes en mètres des principaux points de l'itinéraire, suivies d'un résumé des autres travaux de l'expédition.

Congo State—Kasai. *Mouvement G.* 15 (1898): 215–216. **Wauters.**
Le Kasai et ses affluents. Par A. J. Wauters. *With Map.*

The description of the Kasai accompanies the ninth sheet of the map of the Congo State on the scale of 1 : 2,000,000.

East African Islands. *B.S.R.G. d'Anvers* 22 (1898): 37–53. **Mager.**
Souvenirs de Voyages aux Iles de la Côte Orientale d'Afrique. Madagascar, Réunion, Sainte-Marie, Nossi-Bé, Mayotte. Par M. Henri Mager.

Notes and observations of a popular kind.

French Congo—Brazzaville. **Bourdarie.**
L'avenir de Brazzaville. Par M. P. Bourdarie. No. 4.—Renseignements Coloniaux et Documents publiés par le Comité de l'Afrique Française. Size 12 × 9, pp. 101-106. *Map.*

On the probable effect of the completion of the Congo railway on Brazzaville.

French Possessions. *Deutsche Rundschau G.* **20** (1898): 364-368. **Rumpe.**
Frankreichs Afrikabesitz und seine geschichtliche Entwickelung. Von Dr. med. Robert Rumpe. *With Map.*

The map on the scale of 1 : 30,000,000 is coloured, so as to contrast the area of the French possessions in 1878 and 1898.

French Sudan. **Lartigue.**
Notice historique sur la région du Sahel. Par le commandant de Lartigue. No. 4—Renseignements Coloniaux et Documents publiés par le Comité de l'Afrique Française. Size 12 × 9, pp. 69-101.

A history of the French advance from the Senegal to the Niger.

French West Africa—Ivory Coast. *Ann. G.* 7 (1898): 273-277. **Eyssèric.**
Exploration du Bandama (Côte d'Ivoire) (1896-1897). Par M. J. Eysséric. *With Map and Plates.*

German East Africa. *Petermanns M.* **44** (1898): 73-81. **Werther.**
Die mittlern Hochländer des nördlichen Deutsch-Ostafrika. Von Prem.-Leutn. W. Werther. *With Map.*

This will be specially noticed.

Sahara. *B.S.G. Paris* **17** (1896): 518-554. **Cornetz.**
Le Sahara tunisien, étude géographique. Par V. Cornetz. *With Map.*

Sahara. *Ann. G.* **7** (1898): 180-183. **Schirmer.**
Le Sahara inconnu. L'Adrar des Aouélimmiden. Par M. H. Schirmer.

Sahara—In-Sâlah. *C. Rd., S.G. Paris* (1898): 85-89. **Foureau.**
Longitude d'In-Sâlah. Par F. Foureau.

The longitude of In-Salah was given in the *Quarterly Review*, in an account of Laing's journey, as 2° 15′ E.; on the authority of Sir E. Sabine, Laing's longitude was 1° 51′ E.; Hassenstein, in his map of Rohlf's travels, makes it 2° 10′ E.; while M. Foureau's own result is 2° 43′ E. of Greenwich.

Sahara—Tuareg. *Questions Diplomat. et Colon.* **2** (1897): 33-39. **Attanoux.**
Ce qu'il faut penser des Touareg. Par M. J. Bernard d'Attanoux. *With Map.*

The article contains a list of travellers who were well received in the Sahara and north-western Sudan, and a map of the places at which travellers had been massacred, with the object of showing that the people of the Tuareg confederation are not so dangerous as usually supposed.

Somaliland. **Millosevich.**
Elia Millosevich. Discussione delle osservazioni astronomiche fatte dal tenente di vascello Lamberto Vannutelli addetto alla seconda Spedizione Bòttego in Africa. Estratto dalle Memorie della Società Geografica Italiana vol. viii. 1898. Roma, 1898. Size 9½ × 6½, pp. 60. *Presented by Lieut. L. Vannutelli.*

The astronomical, magnetic, and other observations are recorded and discussed.

Somaliland. *Petermanns M.* **44** (1898): 49-55. **Paulitschke.**
Reise des Grafen Eduard Wickenburg im Somâl-Lande, Juni bis Oktober 1897. Von Prof. Dr. Philipp Paulitschke. *With Map.*

This will be separately referred to.

Somaliland. *Questions Diplomat. et Colon.* 1 (1897): 413-419. **Noll.**
Les explorations italiennes dans la péninsule des Somalis. Par M. Ned Noll. *With Map.*

South Africa. **Stanley.**
Through South Africa. By Henry M. Stanley, M.P., D.C.L. Being an Account of his recent visit to Rhodesia, the Transvaal, Cape Colony, and Natal. Reprinted,

with Additions, from 'South Africa.' London: Low & Co., 1898. Size 7½ × 5, pp. xx. and 140. *Map and Illustrations. Price 2s. 6d. Presented by the Publishers.*

The narrative of a tour in South Africa on the occasion of the opening of the Bulawayo railway, with personal impressions and political remarks.

South Africa. **Younghusband.**

South Africa of To-day. By Captain Francis Younghusband. London: Macmillan & Co., 1898. Size 9½ × 6, pp. 178. *Illustrations. Price 8s. 6d.*

South Africa—Rhodesia. ———

The British South Africa Company. Reports on the Native Disturbances in Rhodesia, 1896–97. Printed for the information of Shareholders by order of the Board of Directors. March, 1898. Size 10½ × 8½, pp. 160. *Map and Plans.*

South-West Africa. *Ymer* (1898): 49–89. **Möller.**

Iakttagelser under en resa i sydvästra Afrika. Af Peter Möller. *With Map and Illustrations.*

A journey from Mossamedes to Humbe, on the Cunene, whence part of the upper streams of that river were explored; then south through Ovampoland, in about longitude 16° E.; and, finally, south-westward to Walfisch bay.

Sudan—Bahr el Ghazal. *Mouvement G.* **15** (1898): 13–18. **Wauters.**

Les missions Liotard et Marchand. Par A. J. Wauters. *With Sketch-map, Portrait, and Illustration.*

These expeditions are referred to in the *Journal* for February, vol. xi. p. 169.

Transvaal. *Quarterly J. Geolog. S.* **54** (1898): 73–100. **Hatch.**

A Geological Survey of the Witwatersrand and other Districts in the Southern Transvaal. By Frederick H. Hatch, PH.D. *With Map and Sections.*

Also a separate copy, *presented by the Author.*

West Africa. *B.S.G. Com. Paris* **20** (1898): 42–53. **Bretonnet.**

Le Moyen-Niger français. Par M. le lieutenant Bretonnet. *With Map.*

West Africa. *Contemporary Rev.* **73** (1898): 698–705. **Robinson.**

The Slave Trade in the West African Hinterland. By Canon C. H. Robinson.

Mr. Robinson lays stress on the want of a coinage for interior Africa, pointing out that the slave-trade is encouraged by the use of slaves as a convenient currency which may be changed anywhere.

West Africa. *Ann. G.* **7** (1898): 230–238. **Schirmer.**

Principaux résultats géographiques des explorations récentes dans la boucle du Niger. Par M. H. Schirmer.

West Africa. *Imp. and Asiatic Quarterly Rev.* **5** (1898): 321–343. **Bourne.**

France and England in West Africa. By H. R. Fox Bourne.

A history of the development of West Africa by British and French enterprise.

West Africa. *Rev. Française* **23** (1898): 193–212. **Demanche.**

Hinterland du Dahomey: La mission Baud-Vermeersch au Gourma.—La mission Bretonnet au Niger. Par G. Demanche. *With Map.*

West Africa. *Contemporary Rev.* **73** (1898). **Westlake.**

England and France in West Africa. By Prof. J. Westlake.

West Africa. *B. Comité l'Afrique Française* **7** (1897): 425–428. **Bourdarie.**

Du Congo à la Méditerranée: La mission F. de Béhagle. Par M. P. Bourdarie. *With Map.*

West Africa. *B.S.G. Commerc. Paris* **19** (1897): 752–760. **Chanoine.**

Mission au Gourounsi. Par le lieutenant Chanoine.

West Africa. *Globus* **72** (1897): 336–338. **Förster.**

Die englisch-französischen Streitfragen in Westafrika. Von Brix Förster. *With Map.*

West Africa. *Petermanns M.* **43** (1897): 225–236, 262–267. **Frobenius.**

Der Westafrikanische Kulturkreis. Von L. Frobenius. *With Maps.*

A discussion of the distribution in Africa of the different types of shields, of bows, of certain forms of house, and of types of clothing material, illustrated by ten maps.

West Africa. *Fortnightly Rev.* **62** (1897): 917–925. **Greswell.**
England and France in West Africa. By Rev. W. Greswell. *With Map.*

Historical references and a map of the present condition of affairs.

West Africa. *B. Comité l'Afrique Française* **7** (1897): 415-422. **Mille.**
Le voyage de M. André Lebon dans l'Afrique occidentale. Par M. Pierre Mille.

West Africa. *B.S.G. Com. Paris* **19** (1897): 729–751. **Voulet.**
Au Mossi et au Gourounsi. Par le capitaine Voulet, 1896–1897. *With Map.*

West Africa. *C. Rd. S.G. Paris* (1897): 301–307. **Voulet and Chanoine.**
Mission Voulet-Chanoine au Mossi et au Gourounsi (1896–1897). Jonction du Soudan au Dahomey. Objet et marche de la mission, résultats obtenus; le pays et ses habitants.

NORTH AMERICA.

Bermuda. **Cole.**
Bulletin of Bibliography Pamphlets. No. 2. Bermuda in Periodical Literature. A Bibliography. By George Watson Cole. Boston: the Boston Book Co., 1898. Size 6 × 4½, pp. 26. *Presented by the Author.*

An interesting collection of the titles of magazine articles on Bermuda, with occasional editorial notes. The entries range in date from 1664 (*Phil. Trans.*) to 1897.

Canada. ———
Annual Report of the Department of the Interior for the Year 1897. Ottawa, 1898. Size 10 × 6½, pp. [596]. *Plates and Maps.*

This report deals with the Dominion lands, the Dominion land-surveys, irrigation, immigration, together with special reports on the North-West Territories, Keewatin, the Rocky Mountains Park, and the Swan River valley.

Canada—Alberta. *Appalachia* **8** (1898): 320–327. **Thompson.**
At the Headwaters of the Bow. By Charles S. Thompson. *With Illustrations.*

Canada—British Columbia. ———
Annual Report of the Minister of Mines for the Year ending December 31, 1897, being an account of Mining Operations for Gold, Coal, etc., in the Province of British Columbia. Victoria, B.C., 1898. Size 10½ × 7½, pp. 449–640. *Map and Plates.*

Photographs are given of a number of the mines, the working of which is fully described.

Canada—British Columbia. *Appalachia* **8** (1898): 327–336. **Habel.**
The North Fork of the Wapta. By Jean Habel. *With Illustrations.*

Canada—Ethnological Survey. *British Assoc. Reports* (1897): 440–451. ———
An Ethnological Survey of Canada. First Report of the Committee.

This report describes the methods by which an ethnological survey of Canada is proposed to be carried out, and includes two appendices: one on the growth of Toronto children, by Franz Boas; the other on the origin of the French Canadians, by B. Sulte, discussing the parts of France from which the ancestors of the present French-speaking population came.

Canada—Historical. *P. & T.R.S. Canada* **2** (1896) (sect. i.): 35–58. **Gosselin.**
Quelques observations à propos du voyage du P. le Jeune au Canada en 1660, et du prétendu voyage de M. de Queylus en 1664. Par M. l'Abbé Gosselin.

Canada—Hudson Bay. **Wakeham**
Report of the Expedition to Hudson Bay and Cumberland Gulf in the Steamship *Diana*, under the command of William Wakeham, Marine and Fisheries, Canada, in the year 1897. Ottawa, 1898. Size 10 × 6½, pp. 84. *Maps and Illustrations. Presented by the Colonial Office.*

This expedition will be referred to elsewhere in the *Journal.*

Canada—Hudson Bay. *Globus* **73** (1898): 105–106. **Bach.**
Die Canadische Expedition zur Hudsonbai und nach Baffinland. Sommer 1897. Von R. Bach.

An account of the Canadian expedition, which will be fully described in the *Journal.*

Canada—New Brunswick. **Ganong.**
A Monograph of the Cartography of the Province of New Brunswick. By W. F. Ganong, M.A., PH.D. (From the *Transactions* of the Royal Society of Canada. Second Series—1897–98. Vol. ii. sect. ii.) Ottawa: J. Durie & Son, 1897. Size 10 × 7, pp. 313-428. *Maps. Presented by the Author.*

After a general discussion of the character of old maps and the method of studying them, the maps of New Brunswick are considered as belonging to eight different types arranged chronologically; from the "Pre-differentiation type" of 1500 to 1534, to the "Exact type," which, for New Brunswick, does not yet exist. There are lists of maps and a bibliography as appendices.

Canada—North-West Territory. *National G. Mag.* 9 (1898): 105–112. **Scidmore.**
The North-West Passes to the Yukon. By Eliza Ruhamah Scidmore. *With Illustrations.*

Historical notes on the various crossings of the passes of the Coast range into the Yukon district and Alaska.

Canada—Nova Scotia. *P. & T.R.S. Canada* 2 (1896) (sect. iv.): 167–179. **Gilpin.**
Coal-Mining in Pictou County. By E. Gilpin, junr., LL.D. *With Map.*

A history of coal-mining in Nova Scotia.

Canada—St. Lawrence. **Dawson.**
Character and Progress of the Tides in Gulf and River St. Lawrence as ascertained by simultaneous observations with self-registering Tide-Gauges. By W. Bell Dawson. (From the *Transactions* of the Royal Society of Canada. Second Series—1897–98. Vol. iii. sect. iii. Mathematical, Physical, and Chemical Sciences.) Ottawa: J. Durie & Son, 1897. Size 10 × 7, pp. 51–68. *Chart and Diagrams.*

Canada—Tides and Currents. **Dawson.**
Survey of Tides and Currents in Canadian Waters. Report of Progress by W. Bell Dawson. Ottawa, 1898. Size 10 × 7, pp. 16. *Map and Diagrams.*

Canada—Yukon District. *National G. Mag.* 9 (1898): 113–116. **Garland.**
Overland Routes to the Klondike. By Hamlin Garland. *With Illustration.*

The routes considered are from Edmonton, and the old telegraph trail up the Fraser river from Ashcroft, or Kamloops, concerning all of which information is scanty.

Canada—Yukon Goldfields. *National G. Mag.* 9 (1898): 117–120. **Dall.**
The Future of the Yukon Goldfields. By Prof. William H. Dall.

The future considered is the very immediate one of next winter, the paper dealing with the disparity between the number of miners reaching Klondike and the possible transportation for their necessary supplies.

Historical—Cabot. *P. & T.R.S. Canada* 2 (1896) (sect. ii.): 3–30. **Dawson.**
The Voyages of the Cabots in 1497 and 1498. A sequel to a paper in the *Transactions* of 1894. By Samuel Edward Dawson. *With Maps and Illustration.*

Mexico—Lower California. **Merrill.**
Smithsonian Institution. United States National Museum. Notes on the Geology and Natural History of the Peninsula of Lower California. By George P. Merrill. From the Report of the U.S. National Museum for 1895, pp. 969–994. *With Ten Plates.* Washington, 1897. Size 10 × 6½.

Mexico—Orizaba. *Appalachia* 8 (1898): 350–355. **Cogshall.**
A Trip to the Summit of Orizaba. By W. A. Cogshall. *With Illustration.*

Mexico—Orizaba and Popocatepetl. *Appalachia* 8 (1898): 356–361. **Douglass.**
The Altitudes of Orizaba and Popocatepetl. By A. E. Douglass.

United States—California. *American J. Sci.* 5 (1898): 355–375. **Ransome.**
Some Lava Flows of the Western Slope of the Sierra Nevada, California. By F. Leslie Ransome. *With Maps.*

United States—Cliff Dwellings. *B. American G.S.* 30 (1898): 111–123. **Mindeleff.**
Origin of the Cliff Dwellings. By Cosmos Mindeleff.

United States—Massachusetts. **Marindin.**

Tables of Cross Sections on the North Shores of Nantucket and Martha's Vineyard, Massachusetts. By H. L. Marindin. Report of the Superintendent of the U.S. Coast and Geodetic Survey, showing the progress of the work during the Fiscal Year ending with June, 1896. Pp. 305–346. Washington, 1897. Size 12 × 9½.

These measurements were made with the object of determining the position of the shore-line as a measure of past erosion, and as a standard from which future erosion may be calculated.

United States—Michigan. *Science* **7** (1898): 577–585. **Spalding.**

A Natural History Survey of Michigan. By Prof. V. M. Spalding.

Historical account of the natural history survey of Michigan.

United States—Ozark Region. *Science* **7** (1898): 588–589. **Keyes.**

The Myth of the Ozark Isle. By Dr. Charles R. Keyes.

The outcrop of the dome-like Ozark Uplift of ancient rocks in the midst of the more recent sediments of the Mississippi Basin, has been held to prove the existence of an island in the Palæozoic ocean which had never since been submerged; but the author points out evidence of the phenomenon being due to a comparatively recent uplift followed by extensive denudation.

United States—Pennsylvania. **Bascom.**

Department of the Interior. Bulletin of the United States Geological Survey. No. 136. The Ancient Volcanic Rocks of South Mountain, Pennsylvania. By Florence Bascom. Washington, 1896. Size 9½ × 6, pp. 124. *Maps and Plates. Presented by the Survey.*

United States—Sierra Nevada. **Turner.**

Further Contributions to the Geology of the Sierra Nevada. By H. W. Turner. Part i. Pp. 529–740. *Maps and Illustrations.* Washington, 1896. Size 12 × 8. —Seventeenth Annual Report of the United States Geological Survey . . . 1895-96.

United States—Wisconsin. *J. Geology* **6** (1898): 182-192. **Squier.**

Studies in the Driftless Region of Wisconsin. II. By G. H. Squier. *With Sketch-Maps.*

On the character and origin of land-forms.

Washington and British Columbia. **Hodges.**

Mining in the Pacific North-West. A Complete Review of the Mineral Resources of Washington and British Columbia. Edited by L. K. Hodges. Seattle, 1897. Size 9 × 6, pp. 192. *Maps. Presented by the Editor.*

CENTRAL AND SOUTH AMERICA.

British Guiana Boundary. *Rev. G.* **42** (1898): 356–360. **Pariset.**

Le Contesté anglo-vénézuélien en Guyane. Par G. Pariset.

British West Indies. *J.R. Colonial I.* **29** (1898): 313–344. **Carrington.**

Our West Indian Colonies. By George Carrington, B.A.

This paper deals mainly with the economic conditions of the West Indies.

Chile. *Tour du Monde* **2** (1896): 577, 589, 601, 613; **4** (1898): 181, 193, 205. **Cordemoy.**

Au Chili. Par M. C. de Cordemoy. *With Illustrations.*

Chile and Argentine Boundary. *Ann. G.* **7** (1898): 239–262. **Delachaux.**

La question des limites chilo-argentines. Examen d'un article du Dr. Steffen. Par M. Henri F. Delachaux. *With Map.*

Also separate copy. *Presented by the Author.*

Colombia. *Verh. Ges. Erdk. Berlin* **25** (1898): 167–176. **Regel.**

Herr Prof. Dr. Fritz Regel: Über seine Reisen im nordwestlichen Kolumbien 1896–97. *With Map.*

Costa Rica. *Ann. Hydrographie* **26** (1898): 102–104. ———

Naranjo (Costa Rica). Juli 1897.

On the harbour of Naranjo.

Cuba. *Fortnightly Rev.* **63** (1898): 855-866. **Lee.**
Cuba and her Struggle for Freedom. By Major-General Fitzhugh Lee.

Ecuador and Peru—Amazons. *Z. Ges. Erdk. Berlin* **32** (1897): 360-409. **Rimbach.**
Reise im Gebiet des oberen Amazonas. Von Dr. A. Rimbach. *With Map.*

Haiti. *Deutsche Rundschau G.* **20** (1898): 289-298, 355-364. **Fischer-Treuenfeld.**
Reminiscenzen eines haïtianischen Regierungsbeamten. Von R. v. Fischer-Treuenfeld. *With Illustration.*

Deals largely with the economic conditions of the Haitian Republic.

Paraguay. *B.S.G. Madrid* **39** (1897), (Suppl.): 1-86. **Garay.**
El Comunismo de las Misiones de la Compañia de Jesús en el Paraguay. Conferencia pronunciada por D. Blas Garay.

Patagonia. *C. Rd., S.G. Paris* (1898): 98-102. **De la Vaulx.**
A travers la Patagonie, du Rio Negro au Détroit de Magellan. Par le comte Henry de la Vaulx. *With Map.*

South America. *Ymer* (1898): 31-48. **Hultkrantz.**
Nagra bidrag till Sydamerikas fysiska antropologi. Af J. Hultkrantz. *With Illustrations.*

A study of the anthropological collections brought back from Nordenskiöld and Dusen's expedition in the extreme south of South America.

West Indies. **Morris.**
Royal Gardens, Kew. Bulletin of Miscellaneous Information. Additional Series I. Report on the Economic Resources of the West Indies, by D. Morris, C.M.G., etc. London: Eyre & Spottiswoode, 1898. Size 9¼ × 6, pp. viii. and 166. *Map. Price 1s. 6d. Presented by the Director, Royal Gardens, Kew.*

West Indies—Cuba. *Fortnightly Rev.* **63** (1898): 705-722. **Davey.**
Glimpses of Havana and the Havanese. By Richard Davey.

AUSTRALASIA AND PACIFIC ISLANDS.

Queensland—Ethnology. **Roth.**
Ethnological Studies among the North-West-Central Queensland Aborigines. By Walter E. Roth. Brisbane, 1897. Size 10 × 6½, pp. xvi. and 200. *Map and Plates. Presented by the Agent-General for Queensland.*

A very remarkable original study of the Queensland aborigines.

Rotuma. *Quarterly J. Geolog. S.* **54** (1898): 1-11. **Gardiner.**
The Geology of Rotuma. By J. Stanley Gardiner. With an Appendix by H. Woods. *With Map and Plan.*

This is the subject of a note, p. 193.

Society Islands. *A travers le Monde, Tour du Monde* **4** (1898): 97-100. ———
L'Expédition de Raïatéa en 1897. *With Illustrations.*

The expedition the visit of which to the Society islands is here described was sent out in order to bring the islands effectively under the control of France.

South Australia—Horn Expedition. *Petermanns M.* **44** (1898): 1-9. **Hahn.**
Die Horn-Expedition in Zentralaustralien und ihre geographischen Ergebnisse. Von Prof. Dr. F. Hahn. *With Map.*

Tasmania and New Zealand. *Deutsche G. Blätter* **21** (1898): 22-30. **Greffrath.**
Geographisch-statistische Uebersicht über die australischen Kolonien. IV. Die Inselkolonie Tasmanien. V. Die Kolonie Neu-Seeland. Von Henry Greffrath.

Western Australia. **Maitland.**
Reports by the Government Geologist in connection with the Water Supply of the Goldfields. Perth. Size 13 × 8½, pp. 8. *Maps. Presented by the Government Geologist.*

Western Australia. ———
The Abrolhos Tragedy. Australia's First White Residents. The Batavia's Castaways. How they Fought and Suffered. [First Complete Translation in

English of the Original Dutch Account, Published Eighteen years after the Massacre.] From the *Western Mail*, Christmas Number, 1897, pp. 3–11. Perth, W.A. Size 19 × 13½. *Map and Illustrations.*

Western Australia. *T. Edinburgh Geolog. S.* **7** (1897): 174–182. **Cadell.**
Some Geological Features of the Coast of Western Australia. By Henry M. Cadell, B.SC.

The result of a visit to the Pilbarra goldfield, in the north-west of Western Australia, in 1895.

Western Australia. *Scottish G. Mag.* **14** (1898): 113–136. **Carnegie.**
Explorations in the Interior of Western Australia, between Coolgardie and Kimberley. By the Hon. David W. Carnegie. *With Map and Illustrations.*

This paper was also published in the *Journal* for March, p. 258. The map is, however, different; although on a smaller scale, it includes the whole of Western Australia, and the routes of other recent travellers.

POLAR REGIONS.

Greenland. *G. Tidskrift* **14** (1898): 116–123. **Ryberg.**
Fra Missions- og Handelstationen ved Angmagssalik. Af Carl Ryberg.

An account of the new Danish enterprise in establishing mission and trading station on the east coast of Greenland.

Greenland—Ice Conditions. *Petermanns M.* **44** (1898): 55–64. **Drygalski.**
Die Eisbewegung, ihre physikalischen Ursachen und ihre geographischen Wirkungen. Von Dr. Erich v. Drygalski. *With Illustrations.*

The article is founded on Dr. von Drygalski's great report on his Greenland expedition.

Spitsbergen. *Quarterly J. Geol. S.* **54** (1898): 197–227. **Garwood and Gregory.**
Contributions to the Glacial Geology of Spitsbergen. By E. J. Garwood, M.A., and J. W. Gregory, D.SC. *With Map and Plates.*

This comprehensive paper treats of the glaciers of Spitsbergen and their action, the varieties of moraine produced by them, the action of marine ice in transporting material and in erosion, traces of former glaciations, and concludes with a series of general conclusions.

Spitsbergen. **Conway.**
With Ski and Sledge over Arctic Glaciers. By Sir Martin Conway. Illustrated from Photographs taken by E. J. Garwood. London: J. M. Dent & Co., 1898. Size 8 × 5½, pp. vi. and 240. *Map. Price* 6*s*. *Presented by the Publishers.*

Sir Martin Conway calls this book an appendix to that describing his first journey in Spitsbergen. He cordially recognizes the services of his companions by name in the preface, but kindly veils the identity of a hired Norwegian who was a hindrance. The geographical results of the expedition will be published in full in the *Journal.* The record of the journey is diversified by the historical associations of the now desolate country, which was formerly a summer rendezvous of thousands of whalers and hunters.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Meteorology—Kites. *Globus* **73** (1898): 272–276. **Herrmann.**
Die Verwendung von Drachen zu wissenschaftlichen Zwecken. Von Dr. E. Herrmann. *With Illustrations.*

On the use of kites for scientific observations.

Oceanography. **Pettersson and Ekman.**
K. Svensk. Vet.-A. Handlingar **29** (1897): No. 5.
De hydrografiska förändringarne inom Nordsjöns och Östersjöns omrade under tiden 1893–1897. Af Otto Pettersson och Gustaf Ekman. *With Charts and Sections.* Pp. 1–126.

A discussion of the oceanographical conditions of the western Baltic and Gulf of Bothnia.

Oceanography. *Verh. Ges. Erdk. Berlin* **25** (1898): 111–127. **Schott.**
Dr. Gerhard Schott: Die oceanographischen Aufgaben und der voraussichtliche Verlauf der geplanten deutschen Tiefsee-Expedition 1898–99.

This is referred to in a note, vol. xi. p. 673.

Oceanography. *B.S.G. Com. Bordeaux* **21** (1898): 81–100. **Thoulet.**
Étude sur la distribution de la magnétite dans les fonds du golfe de Gascogne. Par J. Thoulet. *With Chart.*

Oceanography—Deposits. *P.R.S. Edinburgh* **21** (1897): 25–34. **Hartley.**
On the Cause and Nature of the Chemical Changes occurring in Oceanic Deposits. By Wm. Hartley.

Oceanography—Deposits. *P.R.S. Edinburgh* **21** (1897): 35–39. **Irvine and Murray.**
On Chemical Changes in Marine Muds. By Robert Irvine and John Murray, LL.D.

Oceanography—Fauna. **Monaco.**
Résultats des Campagnes Scientifiques accomplies sur son yacht par le Prince Albert 1er, Prince de Monaco, publiés sous sa direction avec le concours du Baron Jules de Guerne, et M. Jules Richard. Fasc. I.—XII. Imprimerie de Monaco, 1889–1898. Size 14 × 11½. *Maps and Plates. Presented by H.S.H. the Prince of Monaco.*

These fine volumes contain the reports of specialists on the collections made by the Prince of Monaco on his yacht.

Oceanography—North Atlantic. **Pettersson and Ekman.**
Die hydrographischen Verhältnisse der Oberen Wasserschichten des nördlichen Nordmeeres zwischen Spitzbergen, Grönland und der Norwegischen Küste in den Jahren 1896 und 1897. Von O. Pettersson und G. Ekman. Unter Mitwirkung von P. T. Cleve.—Bibang till K. Svenska Vet.-Akad. Handlingar. Band 23, Afd. II., No. 4. Stockholm: P. A. Norstedt & Söner, 1898. Size 8½ × 6, pp. 56. *Maps and Plate. Presented by the Authors.*

The results of this research are given by Prof. Pettersson in the *Journal* for June, vol. xi. p. 611.

Physical Geography. **Klein.**
Jahrbuch der Astronomie und Geophysik. Enthaltend die wichtigsten Fortschritte auf den Gebieten der Astrophysik, Meteorologie und physikalischen Erdkunde. Unter Mitwirkung von Fachmännern herausgegeben von Dr. Hermann J. Klein. VIII. Jahrgang, 1897. Leipzig: E. H. Mayer, 1898. Size 9 × 6, pp. viii. and 370. *Maps and Plates.*

River-temperature. *P. & T.R.S. Canada* **2** (1896) (Sec. iii.): 37–44. **Barnes.**
On some Measurements of the Temperature of the River Water opposite Montreal, made during the Winter with a Differential Platinum Thermometer. By Howard T. Barnes.

Sand-dunes. *Le Globe, B.S.G. Genève* **37** (1898): 22–31. **Ritter.**
Les Dunes. Par M. Étienne Ritter.

This short paper deals with continental or desert dunes, sea-shore dunes, the formation of inverse dunes, small sand-waves—in which the two slopes are different from those of large dunes—on the geographical distribution of the large and the inverse dunes in a chain, and on the dimensions of the constituent sand-grains.

Seismology. *British Assoc. Reports* (1897): 129–206. **Milne.**
Seismological Investigations.—Second Report of the Committee. *With Diagrams.*

This report includes a record of the work done in establishing a seismological survey of the world, accounts of various seismological researches, and of suboceanic changes, all by Prof. John Milne.

Soil Temperatures. **Callendar and McLeod.**
P. & T.R.S. Canada **2** (1896) (Sec. iii): 109–117.

Observations of Soil Temperatures with Electrical Resistance Thermometers. By Hugh L. Callendar and C. H. McLeod. *With Diagrams.*

Terrestrial Magnetism. *P.R.S.* **63** (1898): 64–78. **Ellis.**
On the Relation between the Diurnal Range of Magnetic Declination and Horizontal Force and the Period of Solar Spot Frequency. By William Ellis, F.R.S. *With Diagrams.*

Terrestrial Magnetism. **Naumann.**

Geotektonik und Erdmagnetismus. Von Dr. Edmund Naumann.—Verhandlungen des Zwölften Deutschen Geographentages, Jena 1897. Berlin: D. Reimer, 1897. Pp. 142–166. *Plate.*

Terrestrial Magnetism. **Schmidt.**

Die geographischen Aufgaben der erdmagnetischen Forschung. Von Gymnasial-Oberlehrer Dr. Adolf Schmidt.—Verhandlungen des Zwölften Deutschen Geographentages, Jena 1897. Berlin: D. Reimer, 1897. Pp. 124–141.

Terrestrial Magnetism. **Carlheim-Gyllensköld.**

Sur la forme analytique de l'attraction magnétique de la Terre, exprimée en fonction du temps. . . . Af V. Carlheim-Gyllensköld. Stockholm: P. A. Norstedt & Söner, 1896. Size 9½ × 8, pp. 36. *Presented by the University of Upsala.*

Terrestrial Magnetism. *Ann. Hydrographie* **26** (1898): 21–31. **Schmidt.**

Ueber die Darstellung der Ergebnisse erdmagnetischer Beobachtungen im Anschluss an die Theorie. Von Dr. Ad. Schmidt.

Terrestrial Magnetism. *Terrestrial Magnetism* **2** (1897): 105–114. **Eschenhagen.**

On Minute, Rapid, Periodic Changes of the Earth's Magnetism. By Prof. Max Eschenhagen.

Terrestrial Magnetism. **Leist.**

The Influence of Planets on the Observed Phenomena of Terrestial Magnetism. By Ernest Leist. Moscow, 1892. Size 9 × 6, pp. 1–123. *Maps and Diagrams.* [In Russian.]

Works published by the Physico-Mathematical Faculty of the University of Yuryeff (Dorpat). The data and discussion are given.

Terrestrial Magnetism. *Nature* **57** (1897): 160–163, 180–184. **Rücker.**

Recent Researches on Terrestrial Magnetism. By Prof. A. W. Rücker, F.R.S. *With Diagrams.*

This is a report of the Rede Lecture, an abstract of which appears in the *Journal* for May, vol. xi. p. 522.

Tides. *J. School G.* **2** (1898): 122–132. **Davis.**

Waves and Tides. By W. M. Davis.

A clear and simple statement of the essential principles of wave and tidal motion in water.

Underground Water. *Die Natur* **47** (1898): 17–19, 30–32, 40–41. **Ule.**

Das Wasser im Boden. Von Willi Ule.

Zoogeography. *C. Rd.* **126** (1898): 1358–1361. **Bouvier.**

Note préliminaire sur la distribution géographique et l'évolution des Péripates. Note de M. E. L. Bouvier.

Peripatus is a low form of articulated animal hitherto known only in Central America and the West Indies, the Cape of Good Hope, Australia, and New Zealand. The author shows that it also occurs in Gabun, and is there of a form intermediate between that of Central America and South Africa. The bearing of this fact on the former distribution of land and sea is of some importance.

Zoogeography. *P.R. Dublin S.* **8** (1897): 439–468. **Carpenter.**

The Geographical Distribution of Dragon-flies. By George H. Carpenter, B.SC. *With Map.*

The map shows the approximate range of dragon-fly faunas, and closely corresponds to the faunal regions deduced from the study of the distribution of mammalia.

Zoogeography. *Natural Science* **12** (1898): 100–105. **Duerden.**

The Geographical Distribution of the Actiniaria of Jamaica. By J. E. Duerden, B.SC.

This subject is treated as bearing on the question of a former connection between the Atlantic and Pacific across Central America. A considerable amount of agreement has been found between the Pacific coast actinarians of Central America and those of Jamaica.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Geographical Progress. *L'Universo* **8** (1898): 81–86, 97–101. **Porena.**
Il Giubileo della Nuova geografia. Del Prof. Filippo Porena.

The inaugural discourse of the University of Naples summarized, on the progress of geographical exploration during the last half-century.

Historical. **Castanhoso and Pereira.**
Quarto Centenario do Descobrimento da India. Contribuições da Sociedade de Geographia de Lisboa. Dos feitos de D. Christovam da Gama em Ethiopia. Tratado composto por Miguel de Castanhoso publicado por Francisco Maria Esteves Pereira. Lisboa: Imp. Nacional, 1898. Size 10 × 6½, pp. xlviii. and 154.

Historical. **Lopes.**
Quarto Centenario do Descobrimento da India. Contribuções da Sociedade de Geographia de Lisboa. Textos em Aljamia Portuguesa. Documentos para a Historia do dominio Português em Safim extrahidos dos originaes da Torre do Tombo. Por David Lopes. Lisboa: Imp. Nacional, 1897. Size 10 × 6½, pp. 158.

Historical—Cabot. **Dawson.**
The Voyages of the Cabots, latest phases of the Controversy. By Samuel Edward Dawson, LIT.D. From the *Transactions* of the Royal Society of Canada for 1897. Ottawa: James Hope & Co., 1897. Size 10 × 7, pp. 139–268. *Maps. Presented by the Author.*

Historical—Map. *Riv. G. Italiana* **5** (1898): 50–51. ——
Il planisfero portoghese di Bartolomeo Velio (1561) di recente scoperto nel R. Istituto di Belle Arti in Firenze. Di F. L. P.

Historical—Measures. *B.S.G. Madrid* **39** (1897), (Suppl.): 1–14. **Blázquez.**
La milla romana. Por D. Antonio Blázquez.

The conclusions of this discussion are that the Roman mile, deduced by six different methods, is from 1670 to 1672 metres, *i.e.* from 5479 to 5485 feet, instead of 1481 metres or 4859 feet, as formerly held.

Historical—Mlle. Tinné. *Questions Diplomat. et Colon.* **2** (1898): 75–79. **Vuillot.**
Au Sahara. La vérité sur la mort de M^lle^ Tinné. Par P. Vuillot.

The tribe responsible for the murder of the French traveller, Mlle. Tinné, in 1869 has been the subject of frequent discussion. M. Schirmer having recently recurred to the view that the Tuareg Asjer were guilty of the crime, M. Vuillot here states the case in their favour, and expresses the belief that they have always been loyal to France, and innocent of the murder.

Historical—Vasco da Gama. **Ruge.**
Die Entdeckung des Seeweges nach Ostindien durch Vasco da Gama 1497–8. Vortrag, gehalten in der Gehe-Stiftung zu Dresden am 9 Oktober 1897. Von Prof. Dr. S. Ruge. Dresden: Zahn and Jaensch, 1898. Size 9½ × 6, pp. 48. *Maps.*

Historical—Vasco da Gama. **Ravenstein.**
A Journal of the First Voyage of Vasco da Gama, 1497–1499. Translated and Edited, with Notes, an Introduction and Appendices, by E. G. Ravenstein. London: Printed for the Hakluyt Society, 1898. Size 9 × 6, pp. xxxvi. and 250. *Maps. Presented by the Hakluyt Society.*

This was noticed in the *Journal* for July, p. 20.

Historical—Vasco da Gama. *B.S.G. Lisboa* **16** (1897): 247–389. **Cordeiro.**
O premio da descoberta. (Uma certidão da casa da India.) Por Luciano Cordeiro.

Historical—Vasco da Gama. *Rev. G.* **42** (1898): 161–179. **Gaffarel.**
Vasco da Gama. Par Paul Gaffarel.

Historical—Vasco da Gama. **Aragão.**
Quarto Centenario do Descobrimento da India. Contribuições da Sociedade de Geographia de Lisboa. Vasco da Gama e a Vidigueira. Estudo historico por A. C. Feixeira de Aragão. Lisboa: Imp. Nacional, 1898. Size 10 × 6½, pp. xxxviii. and 304. *Portrait and Plates.*

Historical—Vasco da Gama. **Lima.**

Vesperas do Centenario. O Centenario no Estrangeiro, Conferencia realisada na Sociedade de Geographia de Lisboa no dia 11 de Novembro de 1897. Por Magalhães Lima. Lisboa, 1897. Size 10½ × 7, pp. 30.

Political Geography. *Ann. G.* 7 (1898): 97–111. **Vidal de la Blache.**

La géographie politique à propos des écrits de M. Frédéric Ratzel. Par M. P. Vidal de la Blache.

Based upon Prof. Ratzel's recent work on political geography.

GENERAL.

German Colonies. *Oester. Monats. Orient.* **24** (1898): 13–19, 30–32. ———

Die deutschen Schutzgebiete bei Beginn des Jahres 1898.

German Colonies. **Riebow and Zimmermann.**

Die deutsche Kolonial-Gesetzgebung. Sammlung der auf die deutschen Schutzgebiete bezüglichen Gesetze, Verordnungen, Erlasse und internationalen Vereinbarungen, mit Anmerkungen und Sachregister. Erster Theil. Bis zum Jahre 1892. Auf Grund amtlicher Quellen und zum dienstlichen Gebrauch, herausgegeben von Riebow. Zweiter Theil. 1893 bis 1897. . . . herausgegeben von Dr. Alfred Zimmermann. Berlin: E. S. Mittler und Sohn, 1893–1898. Size 10 × 6½, pp. (vol. i.) xiv. and 706; (vol. ii.) xviii. and 378.

A complete collection of the laws and ordinances relating to the German colonies.

German Colonies—Bibliography. **Danckelman**

Inhaltsverzeichniss zu den Mittheilungen von Forschungsreisenden und Gelehrten aus den Deutschen Schutzgebieten. Band I. bis X. (1888 bis 1897). Mit Benutzung amtlicher Quellen herausgegeben von Dr. Freiherr von Danckelman. Berlin: E. S. Mittler und Sohn, 1898. Size 9½ × 7, pp. 100.

Königsberg Geographical Society. **Tesdorpf.**

Hundert Versammlungen der Königsberger Geographischen Gesellschaft 1881–1898. Zur 100^{sten} Versammlung im Auftrage der Gesellschaft herausgegeben vom Schriftführer Dr. W. Tesdorpf. Königsberg i. Pr., R. Leupold, 1898. Size 9 × 6½, pp. xii. and 198. *Portraits. Presented by the Königsberg Geographical Society.*

This volume comprises a list of members of the Society, and a brief summary of each of the hundred meetings that have been held since the establishment of the Society in 1882.

Mountaineering. *Appalachia* 8 (1898): 361–367. **Douglass.**

Effects of High-Mountain Climbing. By A. E. Douglass.

Mountaineering. **Oberhummer.**

Alpenverein und Alpenforschung. Von Eugen Oberhummer. Wien, 1898. Size 7 × 4½, pp. 98.

Nomenclature. *J. Geology* 6 (1898): 161–170. **Keyes.**

The Use of Local Names in Geology. By Charles R. Keyes.

Statistics. **Craigie.**

Notes on the Subjects discussed at the St. Petersburg Meeting of the International Statistical Institute. By Major P. G. Craigie. Reprinted from the *Journal of the Royal Statistical Society*, vol. lx., part iv. (December, 1897). 1898. Size 8½ × 5½, pp. 54.

A report of the international meeting of statisticians in St. Petersburg, with much interesting material bearing on the relative conditions of the countries taking part, and on various distributions.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Wells.**

Map of Canals and Navigable Rivers of England and Wales. By Lionel B. Wells, M.INST.C.E. Scale 1 : 420,000 or 6·7 stat. miles to an inch. George Falkner & Sons, Manchester and London, 1898. *Price* £2 10*s. in sheets.*

This map shows the present state of inland navigation in England and Wales. By the colouring and manner in which the canals are drawn, the class of vessel by which they can be navigated is shown; those that have fallen into decay are specially distinguished.

England and Wales. **Ordnance Survey.**

Publications issued since June 8, 1898.

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ENGLAND AND WALES (revision):—20, 52, 54, 120, 216, 279, 293, engraved in outline. 1*s.* each.

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25-inch—Parish Maps (revision):—

ENGLAND AND WALES:—**Cheshire,** III. 3, 7, 14, 15; IX. 7, 9, 12, 13; X. 14; XI. 2, 7, 9, 13; XVII. 4; XVIII. 1, 9; XXVI. 16; XXVII. 9; XXVIII. 5; XXXIV. 4, 8, 12; XXXV. 1, 9, 15; XLI. 4, 8; XLVIII. 4, 6, 15; XLIX. 1, 3, 4, 5, 15; L. 1; LI. 9; LV. 16; LVI. 2, 3, 5, 6, 16; LVII. 1, 4; LXI. 10; LXV. 8. **Derby.** VII. 15; IX. 14, 15, 16; X. 9, 13, 14, 16; XI. 10, 15; XII. 9, 11, 12; XV. 3 5; XVI. 1, 2, 3, 4, 5, 7, 8, 10, 11, 12; XVII. 1, 2, 5, 7, 9, 11. **Durham,** II. 14. **Essex,** VII. 16. **Hampshire,** LXXXIII. 4, 6, 10; LXXXIV. 10; LXXXVII. 2, 6; XCIII. 14, 15; XCV. 16; XCVI. 13; XCVII. 4; XCVIII. 2, 3, 4, 10, 14, 15; C. 4, 5, 6. **Hertfordshire,** III. 3, 11; IV. 12; VI. 16; XI. 6; XII. 2; XXIII. 14; XXIX. 6, 8, 11, 12, 14; XXXIII. 3, 4, 7; XXXIV. 1, 2, 3, 4, 9, 13, 14; XXXVIII. 8, 12; XL. 6, 10, 16; XLI. 4; XLIV. 8; XLV. 3, 7. **Kent,** XV. 4, 8; XIX. 3; XXV. 9, 11, 12, 13, 14, 15; XXVI. 2, 6, 9; XXXVI. 4; XXXVII. 16; LXVII. 8; LXX. 2, 4, 6, 8, 10, 11, 12, 14, 15, 16; LXXI. 2, 3, 5, 6, 9, 10; LXXXI. 12, 13, 14, 15, 16; LXXXII. 1, 2 and 6, 9; LXXXIV. 2, 3, 4, 8, 12. **Surrey,** XXXVII. 14; XLIV. 2 and 3. **Sussex,** XLVII. 15; LX. 3, 7, 11, 15; LXI. 4; LXIV. 14, 15; LXV. 10, 11; LXVI. 6; LXXII. 3, 7, 11 and 16. **Westmoreland,** XXVII. 15, 16; XXVIII. 13, 14, 15, 16; XXIX. 5, 8, 9; XXXIII. 3, 4, 7, 10, 11, 12, 13, 14, 15, 16; XXXIV. 2, 3, 4, 6, 8, 9, 10, 11, 13, 14; XXXV. 5 and XXXIV. 8; XLI. 8, 16; XLIV. 14; XLVI. 10; XLVII. 4; LI. 2. 3*s.* each.

Miscellaneous:—One-inch Parish Indexes, printed in colours, showing 25-inch parish maps only: Sheets 274, 299, 300, 301, 302, 304, 315, 316, 317, 318, 319, 329, 330, 332, 333, 344, 345. *Price* 1*s. each.* These are also published showing 6-inch quarter-sheets only. *Price* 1*s. each.*

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Historical Atlas. **Poole.**

Historical Atlas of Modern Europe, from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World, connected with European

History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of Magdalen College and Lecturer in Diplomatic in the University of Oxford. Part xviii. *Price* 3*s.* 6*d.* Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston, 1898. ***Presented by the Clarendon Press.***

Part xviii. contains the following maps: No. 7, Europe in 1360, by C. Oman, M.A.; No. 31, Ireland from 1541 to 1653, by Robert Dunlop, M.A.; No. 79, Western Asia at the time of Saladin, A.D. 1190, by Stanley Lane-Poole, M.A. Each of these maps is accompanied by explanatory letterpress.

ASIA.

China. **Oxenham.**

Historical Atlas of the Chinese Empire. By E. L. Oxenham, F.R.G.S. (late H.B.M. Consul at Chinkiang). Second edition, giving the original Chinese maps with their English counterparts. London: Royal Geographical Society, and John Murray, 1898. *Price* £1 10*s.*; to Fellows of the R.G.S., 17*s.* 6*d.*

The Chinese edition of this historical atlas appeared in 1887, having been compiled by the late Mr. E. L. Oxenham, F.R.G.S., from original maps, and the Chinese works of Chinese scholars. In consequence of representations made to him, Mr. Oxenham decided to issue a second edition of this atlas, containing the original Chinese maps with their English counterparts. His premature death prevented his carrying out his intention, and the Council of the Royal Geographical Society decided to defray the expense of preparing the atlas in its present form for publication.

Indian Government Surveys. **Surveyor-General's Office, Calcutta.**

India, 128 miles to an inch, 1897.—Indian Atlas, Quarter-sheets, 4 miles to an inch: Nos. 3 N.E., parts of districts Karachi and Hyderabad (Sind, Bombay Presidency), additions to 1895; 26 S.E., part of district Ratnagiri (Bombay Presidency), 1898; No. 48 S.W., parts of districts Hissar and Karnal and Native States of Patiala and Jind (Punjab), 1898; 52 N.W., parts of Native States, Gwalior, and Indore (Central Indian Agency), Oodeypore, Tonk, Jhallawar, and Kotah (Rajputana Agency), additions to 1891; 52 S.E., parts of district Saugor and Bhopal, Gwalior, Pathari, Kurwai, Tonk, Muhammadgarh, and Nawab Básoda (Native States), additions to 1896; 67 S.E., parts of districts Bareilly, Pilibhit, and Shahjahanpur (North-West Provinces), and Kheri (Oudh), additions to 1895; 69 N.W., parts of Gwalior and Bundelkhand (Central India Agency), and of districts Jalaun, Jhansi, Hamirpur, and Etawah (North-West Provinces), additions to 1894; 71 N.E., part of districts Jubbulpore, Damoh, Mandla, and Narsinghpur (Central Provinces), and of Rewah (Central Indian Agency), additions to 1888; 77 S.E., parts of districts Nellore, Coddapah, North Arcot, and Chingleput (Madras Presidency), 1897; 87 N.W., parts of districts Kheri, Bahraich, Sitapur, Baru Banki, and Gonda (Oudh), additions to 1892; 129 N.E., parts of district Lakhimpur (Assam) and the Miri and Mishmi Hills, additions to 1896.—Skeleton map of district Pubnah, 4 miles to an inch, additions to 1897.—District Burdwan (Bengal), 8 miles to an inch, 1890.—District Dacca (Bengal), 8 miles to an inch, 1890.—District Montgomery (Punjab), 8 miles to an inch, 1898.—Punjab Survey, 1 inch to a mile. Parts of district Hissar (Punjab) and Bickaneer State (Rajputana Agency), Seasons 1867–68, 1882–84, corrections to 1895.—Bengal Survey, 1 mile to an inch. Parts of districts Lohardaga and Singhbhum (Bengal), Seasons, 1863–65, additions to 1892.—Central India and Rajputana Survey, 1 inch to 2 miles. Sheets: Nos. 161, 162, and 194, 195 (on one), part of Jeypore, Jodhpore, Bickaneer, and Shaikhawati (Rajputana Agency), Seasons 1875–77, additions to 1896; No. 252, parts of district Hissar (Punjab) and Bickaneer State (Rajputana Agency), Seasons 1867–68, and 1882–84, additions to 1895; No. 441, parts of district Jubbulpore (Central Provinces), and of Panna, Ajaigarh (Central India Agency), Season 1856–57, 1866–67, 1869–70, additions to November, 1897.—North-West Provinces and Oudh Survey, 1 inch to a mile; No. 13, districts Saharanpur (North-West Provinces), and Umballa (Punjab), Seasons 1878–80, additions to 1897.—Lower Burma Survey, 1 mile to an inch; No. 281, districts Hanthawaddy, Pegu, and Rangoon Town, Seasons 1881–83, corrections to 1897; No. 447, districts Amherst and Thaton, Seasons 1891–96, additions to 1897.—North-Eastern Frontier, 16 miles to an inch. Sheet: No. $\frac{5\text{–}12}{6\text{–}13}$, parts of Great Tibet, Sikkim, Assam, and Bhután, 1897.—Burma-Siam Boundary, 1 inch to a mile, 6 sheets, 1897.—Index to the Standard Sheets of Sind (Bombay Presidency).—Chart of Triangulation and Traversing, Gujarat Survey. Degree Sheet 10, ¼ inch to 1 mile.

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AFRICA.

German East Africa. **Capus.**

Reiseroute der Missionare Pères van den Biesen, Capus und van der Burgh, von der Station N. D. Auxiliatrice in Ushirombo nach Uha und Urundi. Juni u. Juli, 1895. Nach einer Originalskizze de Père Capus. Scale 1 : 350,000 or 5·5 stat. miles to an inch. *Petermanns Geographische Mitteilungen.* Jahrgang 1898, Tafel 9. Gotha: Justus Perthes. *Presented by the Publisher.*

Tunis. **Service Géographique de l'Armée, Paris.**

Carte de la Tunisie. Scale 1 : 50,000 or 0·7 stat. miles to an inch. Sheet: Environs de Tunis. Publié par le Service Géographique de l'Armée, Paris. *Price* 1.5 *fr.*

GENERAL.

The World. **Andree.**

Andrees allgemeiner Handatlas, 126 Haupt- und 130 Nebenkarten auf 186 Kartenseiten, nebst alphabetischem Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Bielefeld und Leipzig: Verlag von Velhagen & Klasing, 1898.—Lief 17, Karte der Nordpolarregion: Europäisches Russland.—Lief 18, Provinzen Brandenburg, Pommern und Posen: Spanien und Portugal.—Lief 19, Verbreitung der Wichtigsten Wild- und Kulturtiere: Nordwestliche Vereinigte Staaten und Südwestliches Canada.—Lief 20, Deutsches Reich, Staatenübersicht: Norditalien: Sizilien und Sardinien.

The World. **Bartholomew.**

The Citizen's Atlas. One hundred maps and gazetteer. By J. G. Bartholomew, F.R.G.S. Published by George Newnes, Ltd., London. To be completed in 20 parts. Parts 9 and 10. *Price 6d. each.*

CHARTS.

North Sea. **Olsen.**

Chart of the North Sea. Scale 1 : 815,000 or 12·8 stat. miles to an inch. Compiled by O. T. Olsen, F.L.S., F.R.G.S., for the use of fishermen. Published by Norie & Wilson, London, 1898. *Presented by the Author.*

PHOTOGRAPHS.

British Central Africa. **Codrington.**

Eleven Photographs of Angoniland, British Central Africa, taken by R. Codrington, Esq., 1891–92. (1) Bows and arrows of the Achewa; (2) Knives and spears of the Achewa; (3) Yao warrior; (4) Yao woman pounding mealies; (5) Yao woman with Lip-ring (Pelele); (6) Angoni warrior; (7) Stabbing assegais of the Angoni; (8) Dress of the Angoni warrior; (9), (10), (11), no titles. *Presented by R. Codrington, Esq.*

Greenland. **Peary.**

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Anniversary Lodge, 1893–95; (21) Beset off Cape Mercy; (22) Eskimo young man, Whale sound; (23) Eskimo woman, Whale sound; (24) On the Great Ice; (25) Moving the big meteorite; (26) Gnome glacier; (27) Icing sledge shoes; (28) Bowdoin glacier.

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Thirty-two Photographs taken by Dr. Donaldson Smith during his journey through Manchuria, 1897. *Presented by Dr. Donaldson Smith.*

The following is a list of the titles of these photographs:—

(1) Mongolian spotted deer; (2) Yang Shu Pai; (3) A group of Mongols; (4) Salt caravans; (5) Main street of Tsitsihar; (6) Main street in Tsitsihar; (7) Prince Nau Hang Wang; (8) Prince Nau Hang Wang; (9) The "belle" of the Mongols, on the banks of the river Tshor; (10) Chinese junks at Tsitsihar; (11) San Ti Ying, temple and hot springs; (12) The Sungari river from a cattle boat; (13) Taking cart across the river Torre in ferry boat; (14) A Golde (one of the natives of the upper Amur districts) at a railway station near Vladivostock; (15) Mongol village, Hu Pu; (16) At the junction of the Amur and Sungari rivers; (17) Statue of the first governor of the Amur provinces at Kabasopka; (18) Entrance to Lamasery at Ching Pong; (19) Shiao Ho Tsu; (20) Ta Lai Hu Shu; (21) La Ho Ku, Mongols in camp; (22) The river Tshor at Pu La Su Ku, Lamasery in the distance; (23) The river Tshor at Pu La Su Ku; (24) The flooded Nonni; (25) A Nonni steamer on the Amur; (26) Lamas; (27) Mongol women; (28) Mongol village; (29) A Lama and some of his relatives examining a camera; (30) Temple and graves outside of walled town, Shi Hia; (31) Lassooing pony at Dolon Nor; (32) No title.

North-West Frontier of India. **Tate.**

Thirty-four Photographs taken in the neighbourhood of the Railway to Kandahar, by G. P. Tate, Esq. *Presented by G. P. Tate, Esq.*

This set of photographs contains different views of the railway to Kandahar, types of natives, some interesting geological features, and the scenery of the adjacent country. The following is a list of the subjects:—

(1) Chitkan of Panjgur, showing huts for troops in 1892; (2) Village of Turbat in Kej; (3) Types of inhabitants, Kej; (4) Village of Gushtang, in Kej (Makran); (5) Fisher village on the Kalmat creek; (6) Cavalry lines in Chitkan of Panjgur, 1891–92; (7) Tennis court at Chitkan of Panjgur, 1891–92; (8) "A bit" in Panjgur; (9) Fort at Pidárk, Makran; (10) Village on the Kalmat creek, Makran coast; (11) Mir Muhamad Ali Khan, Gichki, Sardar, and Khan's deputy in Panjgur; (12) "A bit" in Panjgur; (13) Fort at Khudabadan, Panjgur; (14) Officer's quarters, and hospital for troops and civil patients, Chitkan of Panjgur, 1891–92; (15) Fort at Hor, Kolwah valley, Kej; (16) General view in Kej, 1891–92; (17) "A bit" in Panjgur; (18) Miri fort in Kej; (19) Bridge near the Mushkáf railway, showing sandstone ridges; (20) "A bit" in Mushkáf-Bolan railway, showing clay and recent stratified rock (sandstones) forming cliffs in Mushkáf river; (21) Inside Kalmat creek, Makran coast, 1891–92; (22) "A bit" showing relative position of railway line as first constructed, and the "high-level" line now in use and recently finished; (23) Railway bridge near river at Mach, Bolan pass; (24) The railway station at Hirok, Mushkáf-Bolan railway; (25) "A bit" on the Mushkáf-Bolan railway; (26) The Laleji plain in Mushkáf-Bolan railway, clay hills capped with sandstones, and containing layers of same; (27) A bridge on the Mushkáf-Bolan railway, showing piers constructed for double line of rails if required; (28) Bridge and tunnel on Mushkáf-Bolan railway; (29) Tunnel through watershed near Kolpur; (30) Kolpur station, and houses of officers and staff, Mushkáf-Bolan railway; (31) "A bit" on railway line near Hirok, showing nature of hills; (32) General view of portion of the line; (33) "A bit" on the Mushkáf-Bolan railway, showing stratified recent sandstones; (34) Mushkáf-Bolan railway, "A bit" in the Bolan pass, showing nature of hills.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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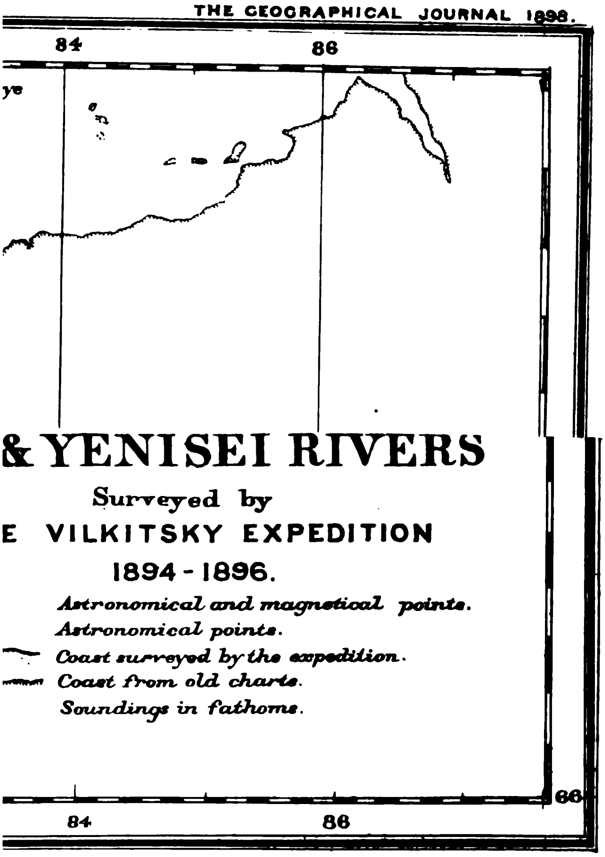
THE GEOGRAPHICAL JOURNAL 1898.



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The
Geographical Journal.

No. 3. SEPTEMBER, 1898. Vol. XII.

THE YANGTSE CHIANG.*

By W. R. CARLES, H.B.M. Consul at Swatau.

The great river of China which foreigners call the Yangtse Chiang, has its sources on the south-east edge of the great steppes which form Central Asia. Rising almost due north of Calcutta, it flows eastward for some 500 miles, draining a very considerable area on its way, and then turns southwards until it is penned in by the great parallel ranges which until recent years have hidden it and its great neighbours from European eyes. Even after entering China its course has remained obscure, and the deep rift through which it makes its way to the navigable portion of its waters in Sze Chuen is, save here and there, still unexplored. In the eastern half of Sze Chuen it receives the drainage of another large area, before entering the country commonly known as the Ichang Gorges, and on leaving the Gorges its arms spread north and south from the Yellow river to the Canton province, affording easily navigable routes through the heart of China, and by the Grand canal to Tientsin.

One of the largest rivers in the world, its importance to China as a waterway in some of the wealthiest and most thickly populated provinces of the empire completely overshadows all the other river-systems of the country.

The actual length of the Yangtse Chiang is at present unknown. The navigable portion, *i.e.* to Ping-shan Hsien, is 1550 miles. West of Ping-shan Hsien the river attains its extreme southern and northern limits; but from a careful measurement made for me of the best maps owned by the Royal Geographical Society, its entire length is not much more than 3000 miles.

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* The system of spelling Chinese names in this paper is in accordance with the rules of the Royal Geographical Society, and it is only fair to the author to state that he prefers the system introduced by Sir Thomas Wade. Map, p. 336.

The estimate made[*] by Dr. H. B. Guppy, R.N., of the probable discharge of the river, places the discharge of water into the Yellow sea at 770,000 cubic feet per second, and the total amount of suspended material carried to the sea every year at 6,428,858,255 cubic feet. Hankau, where Dr. Guppy collected his data for forming this estimate, is not so perfect a position as might be found lower down the river, *e.g.* at Chinkiang, for a large portion of the annual floods at Hankau finds its way across the plain to the river far below the city. The area of drainage is probably between 650,000 and 700,000 square miles.

Of the meaning of the name Yangtse Chiang more than enough has been written. The name is derived from one of the ancient Divisions of China near the coast, and is applied by Chinese only to the tidal portion of the river. Popular as is its name of "Son of the Ocean," there is no good authority for its use. The name in common use by the French, "Le Fleuve Bleu," is very difficult of explanation. The only explanation of which I know is that in Réclus' 'Géographie Universelle': "Ses eaux sont jaunes d'alluvions comme celles du Hoang-ho; mais tandis que ce dernier fleuve est comparé à la terre, 'au principe femelle' dont la couleur symbolique est le jaune, le Yangtze serait, d'après quelques commentateurs, le Fils du Principe mâle, c'est à dire du ciel; par conséquent le nom de Fleuve Bleu, que lui donnent les anciens missionaires et qui est encore trés usité en Europe se trouverait justifié, puisque l'azur est la couleur du ciel." But there must be some simpler explanation, and one resting on a more solid foundation.

For the purpose of the present paper, I have treated the whole river as though the name Yangtse Chiang were applicable to it, as that is the name by which it is best known to Europeans, but to Chinese it is the River, the Great River, or the Long River, and the names applied to it locally are almost unknown except to geographers.

In the following notes I have attempted to throw together some of the additions made to our knowledge in the last fifty years of the main river and its tributaries, and to give some idea of how large a mass of China is comprised in the "Yangtse Chiang valley." As I have no library at hand to refer to,[†] there are necessarily imperfections in the paper, for which I would ask indulgence.

"The most remarkable journeys ever made by a European in Tibet were achieved by a Dutchman, who went from India, by Lhasa, to Peking, and returned by the same route.

"This traveller was Samuel Van de Putte. . . . Father Horace della Penna, in one of his letters, quotes a passage from the journal of Van de

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[*] N.C. Branch of R.A.S., 1881, pp. 5, 6.

[†] The paper was written at Fuchau.

Patte, in which he describes the passage of the river Biciu (Bi-tsiou), the upper course of the Yangtse Chiang: 'The river is so large that, to cross it in boats of skin, he embarked in the morning and landed on an island in the evening, and could not complete the passage across till the middle of the following day.'"*

This was between 1723 and 1736, and the place where this remarkable traveller crossed the river was probably in about lat. 34°, long. 94°, about 2500 miles from its mouth. Little more was learnt by European travellers of the higher waters of the Yangtse Chiang until, in 1845, Pères Huc and Gabet crossed it, probably near the same place. The difficulties of the passage had been smoothed for them by winter, but they also had a remarkable experience.

"We had previously, from our encampment (on the bank of the river), observed dark shapeless masses ranged across this great river; and it was not until we came quite close to these fantastic islets that we could at all make head or tail of them. Then we found out that they were neither more nor less than upwards of fifty wild cattle absolutely encrusted in the ice, . . . which was so transparent as to give a full view of the form and position of the unlucky animals, which looked as though they were still swimming."†

On their return journey these travellers recrossed the river at a point much lower down ‡ on their way from Chiamdo to Ta-chien-lu, near where Mr. T. T. Cooper crossed the river in 1868.

It was in 1873 that the first scientific explorer, Colonel Prjevalsky, struck the river in lat. 34° 43′, long. 94° 48′, and 13,143 feet above the sea. He found it impassable, and writes of it as a rapid torrent fordable in autumn after the floods have gone down, but only in a few places, with an average depth of 5 to 7 feet, and a width, at the spot where he saw it, near the confluence of the Murui-usu with the Napchitai-ulan-muren, of 750 feet; but the whole river-bed from bank to bank was upwards of a mile wide, and, as his guide assured him, this was entirely covered during the rainy season in summer, when the river sometimes overflows its banks.§

Naturally enough, the obstacle which had turned him back in 1873 attracted him there again, and in 1879–80 he crossed and recrossed at a higher point—first the Napchitai-ulan-muren in lat. 35° 20′, long. 93° 10′; then the other large tributary, the Toktonai-ulan-muren, in lat. 34° 10′, long. 92° 40′; and, finally, the Murui-usu itself in lat. 33° 50′, long. 92° 20′, one of the affluents of which he followed up almost to its source in the Tang-la mountains, at a height of 16,400 feet.

In 1884 Colonel Prjevalsky again visited the river near long. 96°; and in 1889 Mr. Rockhill struck it in lat. 32° 58′, long. 96° 50′, whence he followed it down to Kawalendo, long. 98°, where it begins its course southwards. This journey he followed up in 1892 by an exploration of the river further west than had been reached by Colonel Prjevalsky. In this journey he approached so near the source of the Murui-usu in the Tangla mountains, about lat. 33° 45′, long. 90° 50′, that he could see "a few miles away the little rivulets dashing down out of the snow-clad mountains to form the stream which we were fording, and which was not over 2 feet deep, though we were in the midst of the rainy season." *

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* 'Tibet' (Markham), pp. lxii. 312.

† 'Travels in Tartary,' p. 119.

‡ Ibid., p. 291.

§ 'Mongolia,' vol. ii. p. 221.

The sources of the Toktonai were guessed by him to lie some 60 miles to the north of this, and the headwaters of the Napchitai, called by him the Namchutu-ulan, which flows between the Kokoshili and Altyn Tagh ranges, were placed in the Shapka Monomakh.

The existence between these different streams of lakes with no outlet is held by Baron von Richthofen to indicate with certainty the fact, that within a comparatively recent time all this region was still a salt steppe, of which at first only portions on certain lines came into the district having an outlet to the sea.†

Without further details than those given in the Society's *Journal*,‡ it is difficult to identify the river Chumar, which Captain Wellby and Lieut. Malcolm crossed on their way from Tibet, and speak of as the main source of the Yangtse Chiang. It is suggested in the *Journal* that the Chumar may be the same as the Ma-chu. Mr. Rockhill's statement,§ that the Yellow river in its upper course is called the Ma-chu, and the proximity of the Yellow river to the Napchitai-ulan-muren, lead me to question whether A. K. may not have been incorrect in speaking of Ma-chu ‖ as one of the head-streams of the Yangtse Chiang. The account of Mr. Carey's journey ¶ shows how involved are the valleys in that region, and throws some doubt on A. K.'s accuracy.

Between the Tangla mountains, whose south slopes drain into the Tsang-po and the Salwin rivers, and the Kuenlun mountains, which form the south buttress of the Tsaidam steppes, the Yangtse Chiang, even at its source near the 90th meridian, draws on a basin nearly 240 miles in depth from north to south. Below the confluence of the three main streams this basin is somewhat contracted by the north-west south-east trend of the Baian Kara range, and the river is gradually deflected southwards. From the 99th meridian its course is almost due south, passing through the country of the Tanguts, or Si Fans, until at last it enters China. This part of its course is, roughly speaking, parallel with the Mekong and Salwin rivers.** Penned in by high mountains, which form an extension of the great plateau of Central Asia, these rivers continue in close proximity to each other for nearly 200 miles.

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* *Geographical Journal*, May 10, 1894, p. 371.

† 'China,' vol. i. p. 129.

‡ *Geog. Jour.*, February, 1897, p. 216.

§ 'Land of the Lamas.'

‖ Note to (1), *Geog. Jour.*, *supra*.

¶ *Proc. R.G.S.*, 1887, p. 741.

** Colonel Yule's Geog. Introduction to 'River of Golden Sand.'

Captain Gill in 1877, Count Széchenyi in 1879, Captain Bower in 1891, Prince Henri d'Orléans in 1895, and other travellers, have added to our knowledge of the country near Batang, but a considerable tract of country east of the reach between Batang and Li-kiang remained unexplored until visited by M. Bonin in 1895–96. According to him, below the angle made by the Yangtse Chiang near Li-kiang Fu, the river does not follow the course marked in the maps, but makes a sharp turn to the north in order to find a way through the snow-covered heights which bar its passage eastwards, and after reaching within a day's journey of Yung-ning Fu, it turns south through Yung-pei Fu, south of which it resumes its eastern direction, after receiving on its right bank the Pai-shui Chiang, which M. Bonin says has been erroneously considered to be the Yangtse Chiang.

M. Grenard,* on the strength of letters received from M. Bonin,† assumes that the Chin-sha—Captain Gill's "River of Golden Sand"—joins the Ya-lung in about lat. 28°, instead of lat. 26° 35′, as is generally supposed. I do not know whether M. Bonin supports this theory in the account of his travels, which has since been published. Against it are Lieut. Garnier, Mr. Hosie, and other travellers. Lieut. Garnier, who visited the junction of the Pai-shui and the Chin-sha,‡ states that, though the volume of the two rivers is much the same, the natives knew the western stream to be the more important; but he was surprised to find that the country people call the northern stream the Chin-sha, and the western stream the Pai-shui, until near Li-kiang, when the Chin-sha resumes its proper name.

Mr. Hosie, some days after crossing the Ya-lung, saw § from a mountain summit the Pai-shui without apparently recognizing it under that name as the Chin-sha; and some days later, at a point rather west of south of Yung-pei Fu, crossed the Chin-sha, of which he says that there can be no doubt ‖ as to its being the upper waters of the Yangtse Chiang.¶

As M. Bonin speaks of the country between the Ya-lung and Li-kiang as previously untravelled by Europeans, it would seem that he must have forgotten Mr. Hosie's journey, whose account is confirmed by Dr. J. A. Anderson of the China Inland Mission. This gentleman tells me that in 1891, with Messrs. Murray and Smith, he crossed the river by the iron bridge near Li-kiang, where the river is called the Chin-sha, and that they struck it again a few *li* above its confluence with the Ya-lung, and descended by boat past its mouth. He speaks of the Chin-sha as making an immense curve from the south before joining the Ya-lung, to avoid a large rocky mountain.

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* S. G. Paris, *Comptes Rendus*, 1896, p. 250.

† *Geog. Jour.*, November, 1896, p. 515.

‡ 'Exploration in Indo-China' (F. Garnier), vol. i. p. 502.

§ 'China,' No. 2 (1884), p. 32. ‖ Ibid., p. 35.

¶ Mr. Hosie has since drawn my attention to the name (Chin-chiang Kai) of the place where he crossed the river, as confirming the fact that the river crossed was the Chin-sha.

It seems to me possible that M. Bonin may have been misled by the loose manner in which the rivers are named.

If the Pai-shui is not the Chin-sha, it seems difficult to find for it a place south or west of Li-kiang between the Chin-sha and the Mekong, and neither Captain Gill nor M. Bonin alludes to the passage in that neighbourhood of a river [*] of the size mentioned by M. Hosie.

Rising on the south slopes of the Baian Kara range in about lat. 34°, long. 97°, near some of the headwaters of the Yellow river, the Ya-lung follows a course somewhat similar to that of the Yangtse Chiang, from which it is separated by a range of mountains the peaks of which are covered with snow. Mr. Rockhill, whose travels have taken him through much of the basin of this river, says the name means simply "the valley of the Nya" (Tibetan *Nya-rong*). M. Bonin says the Tibetan name is Nag-chu (*l'eau noire*). The Nya-chu and the Za-chu [†] are the two main streams of which it is formed, but there are a great number of minor tributaries, and the An-ning river, along which Mr. Baber travelled through Marco Polo's country of Cain-du, is of considerable size. Below the junction of the Ya-lung and An-ning, the river is known as the Ta-ch'ung, and is spoken of as such both by Mr. Baber and by Mr. Hosie. But, as I have mentioned already, Lieut. Garnier says that at its junction with the Chin-sha it effects a change of name with it. The chief interest of the valley attaches to its inhabitants, Si Fan, Lolos and others, to whom both Mr. Baber and Mr. Rockill have devoted great attention.

The immense depth of the gorges through which the Yangtse Chiang has cut its way in Yun Nan and west Sze Chuen,[‡] and the extraordinary freaks played by its tributaries on the right bank, have prevented the course of the Yangtse Chiang below the Ya-lung from being thoroughly ascertained. Its course, as laid down by the Jesuits, appears to have been mainly mere guesswork, and some corrections have recently been made. Apparently it here attains its lowest latitude—26° N. The strength of the stream and the height of the banks above the river prevent much use being made of it for boat traffic, even in the few portions where no dangers exist. The grandness of these gorges culminates in the "Sun bridge," Tai-yang-chiao, a mountain at least 20,000 feet high, "which falls to the Yangtse Chiang in a series of terraces, which from below appear like parallel ridges, and abuts on the river into a precipice or precipices, which must be 8000 feet above its waters." [§]

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[*] *R.G.S. Proc.* (1886), p. 378.

[†] The similarity of this name to that of the Tse-chu, on which Chiamdo stands, led P. Huc to believe that the Ya-lung was formed by the Chiamdo rivers, and formed a part of the Mekong ('Travels in Tartary,' p. 269).

[‡] 'River of Golden Sand,' p. [107].

[§] Baber, p. 115.

The main affluent on the right bank received in this part of its course is the Niu-lan river, the gorges of which are also very grand.

Mr. Baber's experience of the freaks played by the rivers on the right bank of the Yangtse Chiang was similar to that of Lieut. Garnier, who speaks of rivers in this limestone country passing over one another, splitting in two, and changing from one basin to another.

Ping-shan is generally regarded as the head of continuous navigation, but Mr. Hosie descended the river by boat from Man-i-ssu, 40 *li* higher up. A short distance below Ping-shan,[*] the Yangtse Chiang receives the Hêng river on its right bank. The lower part of this river was descended by Lieut. Garnier, and his party, when starting from Lao-wa-t'an, had to make two short portages. He calls it the Ta-kuan-ho near Lao-wa-t'an, and in the lower portion the Huang-chiang.

The Nan-Kuang, which joins the Yangtse Chiang near Sui Fu, was descended by Mr. Hosie from Hung-shui Kau; but the Yung-ning, which empties itself at Na-ch'i, is apparently the first river on the right bank of the Yangtse Chiang which is of importance as a trade route.[†]

On the left bank the Min or Wen river, at the mouth of which stands Hsu-chau Fu, or Sui Fu, is regarded by Chinese as the true source of the Yangtse Chiang, and the branch of it which passes by Kuan Hsien to Ch'eng-tu Fu is looked upon as the main stream. This river is spoken of by Marco Polo as the *Kian-suy*, which Colonel Yule [‡] interprets to be the *Kiang-shui*, waters of the Kiang. It may, however, I think, mean *Kuan-shui*, the waters of Kuan Hsien.

In Kang Hsi's edict the course of the river is thus described: [§] "The Min has its source to the west of the Yellow river at Ch'i-ch'i-la-ho-na,[||] in the Baian Kara range, which is called in Tibetan Maniak-tso.[¶] The Min Shan of the *Han Shu* is outside the western frontier of China. This is the source of the river. The place mentioned in the *Yü-kung* as 'controlling the river,' is Nai-chu Shan,[**] outside Huang-shêng Kuan,[††] in Sze Chuen of the present day. The ancients spoke of the sources of the river (Chiang) and the Yellow river as near one another. The passage in the *Yü-kung*, 'controlling the Chiang in the Min Shan,' refers to the stream, not to the source; of this there is satisfactory evidence. Its waters flow from Huang-sheng Kuan to Kuan Hsien, and there divide into several tens of branches, which reunite into one stream at Hsin-chin

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[*] Ping-shan is estimated by Captain Blakiston to be 1550 miles from the sea.

[†] 'Three Years in West China,' pp. 68, 160.

[‡] 'Marco Polo' (Yule), 2nd edit., vol. ii. p. 32.

[§] Tung-hua-lu, ch. 106, A.D. 1721.

[||] I do not know what place is intended by this, which is only a transliteration of the Chinese characters.

[¶] Tso probably equals chyok, Maniak-chyok, country of the Maniak, or Menia; cf. 'Land of the Lamas,' p. 218.

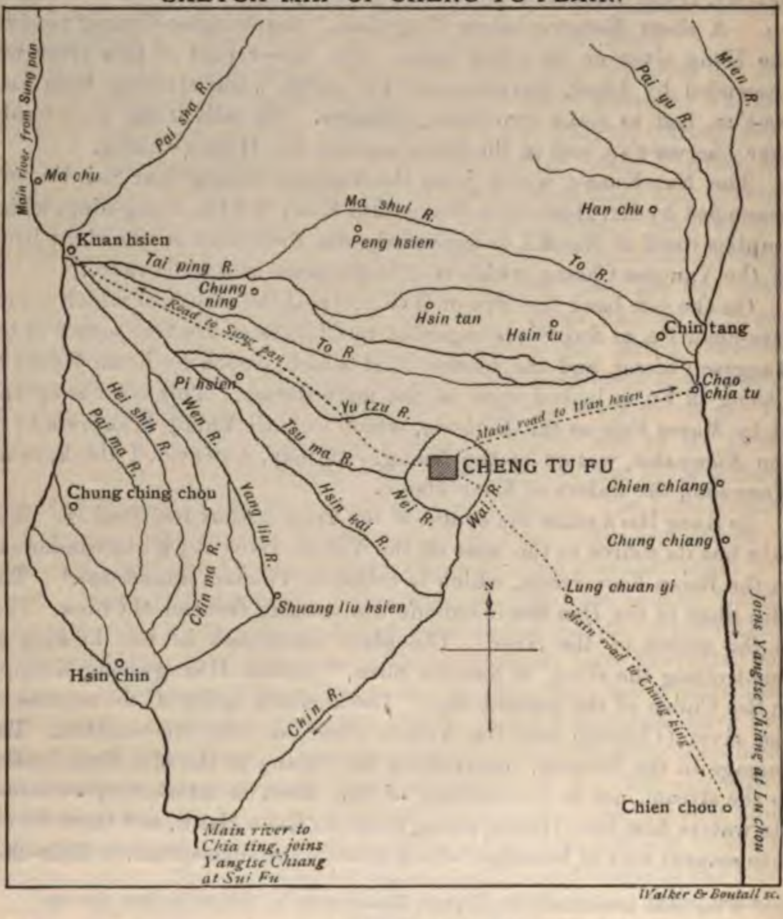
[**] Is this the same as the Gurbu-naidji mountains, which Prjevalsky speaks of as the eastern continuation of the Kuen-lun? ('Mongolia,' vol. ii. p. 182).

[††] North of Sung-p'an Ti'ng.

Hsien, flow south-east to Hsu-chau Fu (Sui Fu), and there join the Chin-sha Chiang."

The description here given would appear to apply more correctly to the western branch of the Min than to that which passes by Kuan Hsien to Cheng-tu Fu, and which—so far as the explorations of Captain Gill and of M. Potanin show—is correctly placed by Chinese map-makers, and has its source to the north of the Min Shan, but considerably to the east of what is now spoken of as the Baian Kara range.

SKETCH MAP OF CHENG TU PLAIN.



Walker & Boutall sc.

The statement in the edict that all the waters reunite at Hsin-chin Hsien is very remarkable, for tradition assigns some of the waters to another river, and such a diversion actually exists. Mr. Baber [*] and Captain Gill [†] both seem to have doubted it, though Baron von

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[*] R.G.S. 'Sup. Papers,' vol. i. p. 29.

[†] 'River of Golden Sand,' p. 109.

Richthofen apparently took it for granted, and I have therefore inquired very carefully into the subject. Recent journeys to Cheng-tu made by Mr. G. J. L. Litton from the east and by Mr. A. von Rosthorn from the south-east, show that the channels which are known to run east from Kuan Hsien connect at San-chiang-chên near Chin-t'ang Hsien [*] with the valley of the T'o river, which enters the Yangtse Chiang at Lu-chau Fu, and Mr. von Rosthorn at Kuan Hsien saw the cutting [†] *Li-tui*, said to have been made by Li Ping, *circ.* B.C. 250, through the hill on the left bank of the river, by which this extraordinary diversion is effected. A strong dam, called the *Tu-chiang-yen*, aids in preventing the waters of the river from following their natural course. These works are said to be intended to protect the country from inundation equally with securing its irrigation. The subjoined tracing of a map in the *Sze Chuen Gazetteer* is sent me by Mr. Litton to illustrate the water-system through the Cheng-tu plain, which probably in ancient times was a great lake, the memory of which still survives in the Chinese name *lu-hai*. Baron von Richthofen speaks of the channels as from 250 feet to 1000 feet wide,[‡] but this width is considerably greater than that mentioned by other travellers, and probably refers only to the part that he visited.

Mr. Baber says [§] that the western branch of the Min river, which is known as the Ta-tu, or T'ung, should be regarded as the main stream, since it brings down a much greater volume of water than either of the two confluents which join it at Chia-ting Fu, below which point the Min is called the Fu river, after the three cities of Cheng-tu Fu, Chia-ting Fu, and Sui Fu. The stretch of the Tung above Wa-su K'au (a little to the east of Ta-chien-lu),[‖] has in his opinion the best claim to be considered the boundary between China and Tibet. This portion of the T'ung is called by the Chinese *Chin ch'uan* [¶] ("Gold stream"), a term which is also applied to the district which it drains, and which is governed by local chiefs, and divided into greater and smaller Chin-ch'uan. The local name of the Chin-ch'uan is Chia-ch'u; the greater and smaller rivers are known as the Tsu-chin and Tsen-la.[**]

Of the grandeur of the scenery of the upper waters of the Ta-tu or Tung river Mr. Baber writes in enthusiastic language. Mr. von Rosthorn agrees with him in considering it a more important stream than the Min branch which passes by Kuan Hsien. The latter owes its relative importance, in the eyes of the Chinese, probably in some part to the fact that it is navigable at times as far as Cheng-tu, and always as far as Hsin-chin Hsien.

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[*] This is the head of the navigable portion of the T'o river. There are no less than three other rivers in this system called the T'o; the T'o itself before reaching Lü-chou is also known as the Mien, the Chung-chiang, the Chien-chiang, and the Lu-shui.

[†] 'Reise in West China,' p. 294 (Geog. Soc. of Vienna).

[‡] 'Letter on Sze Chuen,' p. 64.

[§] R.G.S. 'Sup. Papers,' vol. i. p. 45.

[‖] Ibid., p. 51.

[¶] The south portion of which is also the Yü-tung-ho, or Ch'ang-ho ('Reise in Tibet' (von Rosthorn), pp. 306, 307).

[**] 'Reise in West China' (von Rosthorn), p. 309. The higher waters of the Tsu-chin flow through the valley inhabited by the Somos, who were visited in 1896 by Mrs. Bishop.

After receiving the T'o river at Lu-chau Fu, the next important affluent of the Yangtse Chiang is the Chia-ling, which joins it at Chung-king. This river rises in Kan Su, as does one of its main branches, the Pai-shui, and is the last of the long series of rivers running north and south, which are such a striking feature in any map of Sze Chuen, Yun Nan, and East Tibet. Count Szechenyi travelled by boat through the portion of Shen Si traversed by the Chia-ling river.

The upper waters of the Fu Chiang, a branch of the Chia-ling which rises near Sung-pan Ting, were explored by Captain Gill in 1877, as far down as Mien Chau. This river in Dr. Bretschneider's map is also called the Honton.*

The Fu-ling, Chien Chiang, Kung-t'an, or Wu-chiang, which joins the Yangtse Chiang at Fu Chau on the right bank, is the last considerable tributary received before reaching the gorges leading to Ichang. This river is important as the first of the streams which form the great network of water-communication which binds Peking and Canton with Central China. By the Fu-ling Canton can be reached with only two short portages, and a certain amount of trade with Hankau is carried on by this and the Yuan river in preference to taking goods up the Yangtse Chiang.

The gorges which have shut in the Yangtse Chiang almost from its source close in upon it again below Fu Chau, and continue to within a few miles of Ichang, contracting the river at one or two points to a width of 150 yards.

In the autumn of 1896, some 40 miles below Wan Hsien, a landslip occurred, which carried down into the river a portion of the mountain-side, estimated by Mr. Bourne at 700 yards by 400 yards. This at present forms a complete obstacle to any hope of steam navigation between Ichang and Chung-king, and is much more formidable than the Yeh-tan, Hsin-tan, or any of the other rapids which had hitherto been in question. The Ching-tan, or Hsin-tan, was similarly formed some two hundred and fifty years ago, and it is probable, therefore, that other rapids originated in the same way.

Many rivers are received on either bank before Ichang is reached, of which the most important is the Ching-chiang, which enters the Yangtse Chiang on the right bank below Ichang. Mr. A. von Rosthorn, who travelled by this route to Wan Hsien, mentions a repetition in this limestone region of the curious phenomena witnessed by Lieut. Garnier in Yun Nan and Sze Chuen.

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* It has recently been followed by Mr. A. J. Little from its upper waters to its junction with the Chia-ling river.

At Sha-shih, the port of Ching-chau Fu, the character of the country changes, and an extensive embankment, 30 feet high, and from 70 feet to 300 feet wide at the base, is necessary to protect the country from inundation. The inland water communication extending from Ching-chau to Han-kau, on the east, and connecting with the higher parts of the Han river, exposes an immense area to suffering from floods, and the city itself was almost destroyed on one occasion by freshets in the inland waters. The facilities of communication afforded by these routes make Sha-shih a centre of great commercial value, for, independent of the great highway of the Yangtse Chiang and of the canals already mentioned, there are also two large canals on the right bank of the river connecting with the Tung-ting lake, which have their outlets above and below Sha-shih.

The area of the Tung-ting lake is over 2000 square miles. Its size and its proximity to the Ichang gorges render it a most important protection to the lower parts of the Yangtse Chiang against floods descending from Sze Chuen. These find their way to the lake as to a huge reservoir; unless the rivers of Hu Nan are in flood at the same time as the Yangtse Chiang, the immediate effect produced by the latter is almost confined to the basin of the lake, and it is only gradually that the valley of the Yangtse Chiang is affected.

The area of Hu Nan is estimated at 70,000 square miles, and the whole of its drainage is through the Tung-ting lake. The more important of the rivers are the Hsiang, a branch of which known as the Lei river rises near the little Mei-ling, or Che-ling pass, on the frontier of Kwang Tung, and passes the great cities of Heng-chau, Hsiang-tan, and Chang-sha. Baron von Richthofen refers to continuous water-communication with Kwang Si as existing 120 miles west of the pass, which is kept up practically by means of gates. This is, I believe, by the main branch of the Hsiang river and *viá* Kwei-lin Fu. So far as I can learn, the Hu Nan boats, which are occasionally seen in Kwang Si, are transported for a short distance on rollers to the river in Kwang Si, which passes Kwei-lin Fu.

According to the 'Kwang Si Gazetteer,' the Hsiang river of Hu Nan, which empties itself into the Tung-ting lake, and the Kwei or Li river, which joins the West river at Wu-chau Fu, in Kwang Si, have the same source to the south-east of Hsing-an Hsien, in Kwei-lin Fu. The Gazetteer places the source of these rivers in a temple on Hai-yang Shan, or Yang-hai Shan, called the T'ien-hsin Ssu. The divide, which is marked in some Chinese maps, takes place just to the east of Hsing-an Hsien. I do not think that this has hitherto been certified by any European traveller.

West of the Hsiang river is the Yuan river, by which Mr. Margary travelled in 1874 on the journey which opened communication for us between Burma and China. The difficulties of the route are considerable, but it offers an alternative line to the Yangtse Chiang to travellers to Yun Nan, and is actually navigable beyond Chen-yuan Fu in Kwei Chu. A certain amount of trade also exists with Sze Chuen by a north branch of this river *viâ* Yu-yang and the Chien river to Fu Chau.

Another river of some size is the Ling-kiang, also known as the Chin-chi river, or Li river. This is only navigable on its lower waters. The higher waters pass through part of the Hu Peh tea district.

By the Han or Hsiang river, which joins the Yangtse Chiang at Hankau, communication exists by the Pai river to She-chi chen in Ho Nan, by the Tan river to Shen Si, or by the main stream to Han-chung Fu. It is said at Hankau that boats can travel up stream 4000 *li* by three different routes—the Yangtse Chiang, the Yuan river in Hu Nan, and the Han river. Père David's journey [*] in 1873 established the correctness of the saying as regards the Han; but the rapids above Lao-ho k'au (1360 *li* from Hankau) made navigation above that point difficult and dangerous.

The main branch of the Han rises beyond the western frontier of Hu Peh, in the high mountains south-east of Lio-yang Hsien. A northern branch of almost equal importance rises on the south slopes of the Ch'in Ling, flows south until it approaches Han-chung Fu (a few miles west of which it joins the main river), then eastwards in the valley between the Chin Ling and the continuation of the Ta-pa Shau known as Lan Shan, until it reaches Hsiang-yang Fu, whence it turns south to Hankau.

The Han has the peculiarity of increasing in width [†] from its mouth (200 feet) upwards, until at Sha-yang, 168 miles above Hankau, its width is half a mile, then often a mile, and even a mile and a half. The elevation of the surrounding country above low water at Hankau is 40 feet, but this diminishes until at Hsien-tao Chên, 76 miles from Hankau, the elevation is only 1 foot. The consequence is that, despite embankments, floods are of annual occurrence, and the whole country between Ching-chu Fu on the west, to some indefinite point east of the old mouth of the Han below Hankau, is under water in summer. As soon as the wheat is cut in the spring, the villagers leave the plains to retire to the hills, or to the mounds in the plains, on which are clusters of houses with boats drawn up alongside of their doors, and fleets of boats are soon seen sailing across the pasture land and fields. Their place is taken in winter by herds of ponies and cattle, whose numbers are vastly exaggerated by constant mirage.

Driven onwards by the immense pressure from behind, the waters of the Yangtse Chiang, though moving in an almost perfect plane,[‡] have an average surface current throughout the year of 2 knots [§] at Hankau, where the river is 1450 yards broad, and has an average depth of 42 feet. In their course to the sea, the entrance to the Poyang lake is almost the only place below Wu-hsueh at which a passenger on a steamer can detect the influx of any other river. The main river, its tributaries, and the inland canals all form a part of one great network, which proclaims the delta of the river. The rivers of East Hu Peh, North Kiang Si, An Hui, and Kiang Su, which enter the Yangtse Chiang, are scarcely recognizable as fresh contributions. Even the waters of the Yellow river drained into the Yangtse Chiang in 1887 without for some time exciting any comment on the addition to its volume.

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[*] 'Journal de mon. 3^{me} voyage' (P. David).

[†] 'Letter on Hu Peh' (Richthofen), p. 1.

[‡] The fall from Hankau is only 53 feet in 602 miles, or little over 1 inch to the mile.

[§] 'Notes on the Hydrology of the Yangtse' (Dr. Guppy, R.N.).

The coalfields of Hu Nan have of late concentrated attention on the Tung-ting lake and the valley of the Hsiang as the future trade route between South and Central China; but until recently the valley of the Kan, which is navigable by boat from near the Mei-ling pass on the frontier of Kwang Tung to the Poyang lake, was the great official waterway from Canton to Peking.

The Shu or Chin Chiang, which passes Nan-chang Fu to the north-west of the lake, and the Chin or Chin-chia Chiang, which descends from Kwang-hsin Fu on the north-east, are the largest of the other rivers which drain into the Poyang lake, but part of the waters of Hui-chu Fu in An Hui are also received by it, and it is noteworthy how many routes exist through the mountains on the east to Che Kiang and Fu Kien.

The lake, which is reported to be 1800 square miles in extent, acts, like the Tung-ting lake, as a great reservoir to check inundations.

On leaving Kiang Si and entering An Hui, the river at Wuhu reaches the point where a branch in olden days made its way southwards to the Chien-tang gulf, near Hang-chau Fu. Its course is conjectured to have been through a series of lagoons,* known in ancient times as the five lakes (the Chen-tse), and its delta is presumed not to have extended further east than the Lang-shan hills, but the whole subject has been a fertile source of controversy. Another branch must have passed by Sung-kiang Fu, and thence near to Shanghai. The south bank of the present course of the river seems to give indications that its bed was in former days on a higher level than now, but even at the present day it is only by embankments that the Yangtse Chiang is prevented from finding a way for some of its surplus waters by the Tai Hu and Su-chau to the sea.

The area of the Tai Hu and the other lakes in the southern delta of the Yangtse Chiang has been estimated † at 1200 square miles (out of a total area of 5400 square miles), and the total length of the small channels used for irrigation and navigation at 36,000 miles. But these figures are based upon imperfect maps of the country, and therefore not thoroughly trustworthy.

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* "Inland communications in China," *C.B. of R.A.S.*, pp. 9, 112.

† "Delta of the Yangtse" (*Geog. Mag.*, October, 1877), Sam. Mosseman.

On the north bank of the river an even more marvellous system of artificial waterworks exists. The Huai river, which, with its seventy-two tributaries, is a most important commercial route to North An Hui and Ho Nan, used to find a natural course to the sea to the south of Shan Tung, but has been diverted by a double series of lakes and innumerable canals, and has now no existence as a river east of the Grand Canal. The enlargement of some lakes and the excavation of others were carried out with a view to preventing too great a pressure on any one point of the Grand Canal south of the old course of the Yellow river. The greater part of the Huai now finds its way to the Yangtse Chiang through different openings in a large canal, which runs almost parallel with the river for a distance of 140 miles. North of this canal lies an immense parallelogram, estimated by Père Gandar at 2,300,000 hectares (= 8876 square miles) in extent, which is below the water-level. This is intersected by a series of waterways kept under the most careful control, and constitutes one of the most valuable ricefields in the country. To protect it from inundations by the sea, immense dykes and a large canal stretch north and south between the Yangtse Chiang and the old course of the Yellow river. Through these dykes are eighteen openings for canals to the sea, but the main drainage is southwards to the Yangtse Chiang. Between the dykes and the sea lie the flats which form the great salt-fields of Central China.

The Yangtse Chiang in its lower reaches is subject to great and rapid changes, of which little trace is evident to the eye after the lapse of a few years, though the depth of the river in many parts is 140 feet and more. One of the most notable instances is at Chin-kiang. The earliest European travellers to Peking by the Grand Canal speak invariably of the city of Kua Chau, and only refer incidentally to the passage of the Yangtse Chiang. At present the nearest entrances to the northern and southern portions of the Grand Canal are miles apart; the passage between them, along the waters of the Yangtse Chiang, is often tedious and sometimes impracticable. But at that time the southern entrance to the canal was by a canal which ran between Chin-kiang and the river, and debouched opposite Golden island, which was within hailing distance of Kua Chau.

When our fleet ascended the Yangtse Chiang in 1842, it was to the south of this island that it passed. Now to the south of "the island" is cultivated land, studded with trees and villages, and the only existing canal south of Golden island is so shallow as to be in winter not navigable even for boats. On the north of the so-called island (Golden island) the city of Kua Chau has been completely engulfed, and even its north wall has long since been lost to sight.

The changes which are taking place in the lower reaches of the river, in the formation of islands and the alteration of channels, are on an even larger scale. One of the best-known instances is the island of Tsung-ming, near Shanghai, the population of which rose [*] from 12,700 families at the end of the thirteenth century to 89,000 at the beginning of the eighteenth, and is now estimated at 1,150,000 souls.

The great river known to Europeans throughout its whole length as the Yangtse, or Yangtse Chiang, from the name which it bears on Chinese maps in its tidal portion only, undergoes many a change of name. In its higher waters in Tibet, the Murus, or Mur-usu, or Murui-osu ("Tortuous [†] river") joins the Napchitai-ulan-muren and Toktonai-ulan-muren, and below their confluence the river is known as the Dre-chu, or Di-chu,[‡] variations of which have reached us through different travellers in Bichu, Bicui, Brichu, and the Brius of Marco Polo. Its Tibetan name is Link-arab, and the Chinese name [§] Tung-tien-ho. Where the river forms the boundary between Tibet and China, it is called by Chinese the Chin (or Kin) sha Chiang, and by Tibetans the N'geh-chu ; near the confluence of the Yalung it is called the Pai-shui Chiang, or White Water river; and as far as Sui Fu (or Sü-chu Fu) the Chin Ho.[‖] Below this it is called the Ta Ho, or Ta Chiang ("Great river"), and also as far as Wan Hsien, the Min Chiang.[¶] In the gorges of Ichang it is the Ta-ch'a Ho [**] ("river of Great Débris"). At Sha-shih it has the name of Ching Chiang from Ching, an ancient Division of China, through which it passes. Below Hankau it is called the Chiang, Ch'ang Chiang (Long river), Ta Chiang, or Ta-kuan Chiang ("Great Official river"), and for the last 200 miles of its course it appears as the Yangtse Chiang, a name which it gains from Yang, another of the ancient Divisions of the empire, and which is still retained by Yang-chau Fu.

The fall of the river is very rapid. Mr. Rockhill assigns an altitude of 13,000 feet [††] to the place where he first crossed it, some distance below the junction of the Mur-usu with the Napchitai and Toktonai rivers, and of 12,000 feet to the ferry where he recrossed it 84 miles lower down. From Batang (8540 feet) to Wa-wu, in Sze Chuen (1900 feet), the fall was estimated by Mr. Baber at not less than 8 feet per mile; thence to Huang-kuo-shu (1200 feet), at 6 feet per mile; below this to Ping-shan (1025 feet), about 3 feet; and from Ping-shan to Chung-ching (630 feet), approximately 19 inches, and in its lower course less than 6 inches. The fall between Chung-ching and Ichang (129 feet) is about 13½ inches; thence to Hankau (53 feet) only 2½ inches, and from Hankau to the sea little more than 1 inch per mile.

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[*] 'L'Ile de Tsong-ming' (Le P. H. Havret, S.J.), pp. 37, 38.

[†] 'Mongolia' (Prjevalsky), vol. ii. pp. 221, 306; 'Land of the Lamas,' p. 196.

[‡] Ibid. The meaning of this is uncertain. Mr. Rockhill disputes Colonel Prjevalsky's explanation of Cow Yak river.

[§] Ibid.

[‖] Baber, p. 107.

[¶] 'Ichang to Chung King' (Rosthorn), p. 30.

[**] 'River of Golden Sand,' p. 67.

[††] 'Land of the Lamas,' pp. 201, 380.

The diagrams published annually * by the Imperial Maritime Customs, showing the rise and fall of the Yangtse Chiang at the Treaty ports, have thrown some little light on the relations of the different confluents of the Yangtse Chiang to each other, and of the part played by the Tung-ting lake as a check against sudden floods in the lower parts of the river. Judged by these diagrams, the height of the water at Hankau would appear to be almost independent of that brought down from Sze Chuen, though at Chung-king the Yangtse Chiang, with the Chia-ling, are together over 900 yards wide, and the annual rainfall is 38 inches, and though the volume of water which passes Ichang † was estimated at 500,000 cubic feet per second.

For instance, in June, 1892, when the river was only 13 feet above low-water mark at Chung-king, at Hankau it stood at 35 feet. In July the river at Chung-king was swollen by a freshet from 38½ feet to 97 feet, and produced an immediate rise at Ichang from 29½ to 49 feet; but at Hankau the rise was only 4 feet, and before the end of the month the river at Hankau fell without any regard to later freshets at Ichang.

The year 1890 was memorable at Hankau, as the river rose steadily through June until it reached 44 feet, then fell a few feet, to rise again in the latter part of July and beginning of August, until it reached 47 feet, and it did not fall below 45 feet until September 21. But at Ichang nothing had occurred to account for the flood at Hankau, with the exception of three moderate freshets in the space of four weeks, the last of them occurring on August 5, after which date the river at Ichang was never very high.

In 1889 the river at Hankau from July 4 to November 15 was never below 40 feet, but at Ichang there was no very high water, and on November 12 the level there had fallen to 12½ feet.

Though the state of the river at Hankau, in consequence of its low level, depends in part upon the rainfall in the lower waters and their condition, yet it is evident from the above figures that the Hu Nan rivers and the Han river are very important factors. Indeed, the Yangtse Chiang at Ichang, above the confluence of these rivers, seems so disproportionately small, in comparison with the volume of its upper waters and of its tributaries, that again and again the question has occurred to me whether some of its waters are lost in the limestone regions which it traverses.

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* 'Reports on Trade at Treaty Ports.'

† The extreme width of the river at Ichang is 1015 yards; in winter its width is 643 yards; 46 feet 2 inches is the highest water-mark. At Hankau 48 feet is the highest water-mark above low water.

CIRCUMNAVIGATION OF LAKE BANGWEOLO.*

(*July to September*, 1896.)

By POULETT WEATHERLEY.

PREFATORY REMARKS BY THE PRESIDENT.

MR. WEATHERLEY'S examination of Lake Bangweolo will perhaps be more fully appreciated if his account of the circumnavigation in his steel boat is prefaced by a very brief retrospect of the exploring work that had previously been accomplished in this region.

It was in 1798 that the accomplished Portuguese traveller, Dr. Lacerda, discovered the river Chambeze, the chief eastern tributary of Lake Bangweolo, and made his way round its northern side towards the capital of the chief Kazembe. He died within a march or two of that place. In 1802 to 1811, the Pombeiros, sent by Ferdinand de Noronha, Captain-General of Angola, traversed the same country; and in 1831, the Portuguese captains Monteiro and Gamitto also followed the route of Lacerda, but without astronomical instruments.

About thirty years had elapsed before Dr. Livingstone, in December, 1863, left the western shore of Lake Nyasa at Kota-kota, and, making a journey of many days to the north-west, received tidings of the existence of a lake called Bemba, whence issued the river of Luapula, flowing to Lake Mweru. He afterwards traversed the country in the footsteps of Lacerda, crossing the Chambeze and receiving fuller information respecting the lake. It is a large but shallow expanse of water, with swampy shores to the east and south, being the overflowing of the country at the base of the Tanganyika plateau. The first name received by Livingstone, of Bemba, refers to the Bemba nation inhabiting the K-emba region to the north of the lake. His other name of Bangweolo is unknown in the country. Mweru, or Mwelu, is the universal name for a lake among the natives, and *Pa-mwelo*, as suggested by Mr. Sharpe, may be the word rendered by Livingstone *Ba-ngwelo*, the word meaning "at the lake." Bangweolo is now the generally received name.

In his last journey, Dr. Livingstone crossed the Chambeze about a week's journey from its mouth, then re-crossed and made his way to the north shore of the lake. Crossing to an island called Matipa, he eventually reached the southern side, and began a journey through deadly swamps to the Luapula river. But he was taken ill, and had to be carried. Reaching the country of Ilala, he was not allowed to stay in the town of the chief Chitambo, and his faithful followers took him back towards Kabenda, a few hours' march, and built him a hut. His devoted servants, Majwara and Susi, tenderly nursed him, and he died on May 4, 1873. This event makes the southern shore of Lake Bangweolo almost classic ground to geographers. Dr. Livingstone's heart was buried under a venerable *mpundu* tree. The spot was recently visited by Mr. Weatherley, who sent some of the leaves home from Livingstone's tree. They are now preserved in a glass case in the hall of your house at 1, Savile Row. The story of the last journey of the illustrious explorer must always add a special interest to the shores of Lake Bangweolo.

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* Paper read at the Royal Geographical Society, June 6, 1898. Map, p. 336.

The next visitor to the lake was Lieut. Victor Giraud of the French navy, who landed at Dar-es-Salaam, and crossed the country to Lake Bangweolo, embarking on its waters, after having forced a passage through the dense growth of rushes, on July 18, 1883. He visited the islands of Kisi and Kirui in a small portable boat he had brought with him, and then made for the outlet of the Luapula, in the south-west corner of the lake. He descended the river for several days, but when he reached the first rapid he was attacked by Meri-meri, the chief of the Wa-usi, to whom, after a brief resistance, he surrendered at discretion. His boat, cloth, and ammunition were taken from him, and at last he escaped to Kazembe's, where the fleecing process was continued. Finally, he fled to an international station on Lake Tanganyika, almost destitute. It was natural, under such circumstances, that he should have failed to understand or appreciate the native character.

In 1890, our Gold Medalist, Mr. Joseph Thomson, was employed by Mr. Rhodes and the British South African Company to explore the less-known parts of British Central Africa. He was joined by the son of our old friend Colonel Grant at Kimberley, and they reached Blantyre in July, 1890. Leaving Kota-kota, on the western shore of Nyasa, Thomson reached Chitambo's, but he was still 20 miles from the spot where Livingstone died. His earnest desire to visit it was prevented by sickness in his caravan. Without going any nearer to the lake, he made for the river Luapula, and followed its course as far as a place called Kalonga, returning to Blantyre in February, 1891.

In the same year, Mr. Alfred Sharpe made an interesting journey from Fort Abercorn, a station established by Sir Harry Johnston at the southern extremity of Tanganyika, in 1889. Mr. Sharpe reached Kazembe's in September, 1890, rounded the head of Lake Mweru, and penetrated into the Garenganze country to the Lufira river. In August, 1892, Mr. Sharpe again set out from Fort Abercorn to Lake Mweru, with a steel boat in sections. He was thus enabled to navigate Lake Mweru, and to ascend the river Luapula as far as the head of navigation, at the rapids, to which he gave the name of the Johnston falls. He received from our Council the Cuthbert Peek award in 1896.

It will have been seen that Bangweolo had only been visited once, by M. Giraud, since the time of Livingstone. Its circumnavigation and complete exploration was reserved for Mr. Powlett Weatherley. This indefatigable explorer left England, on his third African expedition, in January, 1894, embarking on the Zambezi in May. He took out a boat, which was swamped and lost when being towed up the river. In August he reached Fort Abercorn, and in July his friend, Mr. Leslie Sweet, sent him out another steel boat in sections, which arrived safely, and was called the *Vigilant*. From September, 1894, to June, 1895, Mr. Weatherley was engaged in building a house and barracks near Lake Tanganyika, at a place called Momira, in the Ulungu hills. He also planted a garden, and devoted all his spare time to teaching his boys not to be idle. He made them compete at long and high jumps, leap-frog, human cock-fighting, and rope-climbing; but of course he took care that, at everything he taught them, he could lick their heads off. Momira, where there is a beautiful clear running stream, is intended as a sanatarium.

In July, Mr. Weatherley set out for Lake Mweru, crossing the country of the powerful and generally hostile Awemba, a native whose influence extends from Tanganyika to Mweru, under the great chief Kitiamkulu. He succeeded in gaining the friendship of the Awemba, and established his camp at Chipamba, on Lake Mweru. Here he found himself in an important position at the opening of the year 1896. He was the only white man who was on friendly terms with the Awemba, and his word was law on the Ulungu hills and amongst the surrounding tribes. He is a dead shot, and is known far and near as "N'Gadamika," a word which has that meaning. His influence with the native chiefs is marvellous, and he is beloved by his own followers. His power of bringing about friendly intercourse with chiefs into whose territory no European has hitherto ventured, and his knowledge of the people, ought to be utilized for the good of his country. At the end of June, 1896, Mr. Weatherley left Chipamba, on Lake Mweru, with the object of exploring Bangweolo, and the result is recorded in this paper. He was the first to circumnavigate the lake, and his examinations of the north-western and western sides constitute new discoveries. It is needless to dwell further on Mr. Weatherley's qualifications. "No one," said Livingstone, "ever gains much influence in Africa without purity and uprightness," to which may be added fearlessness. Mr. Weatherley has gained astonishing influence. His paper on the circumnavigation of Lake Bangweolo speaks for itself.

I started on June 25, from Chipamba on Lake Mweru, with the intention of exploring the region of the upper Luapula, and of circumnavigating Lake Bangweolo. My party consisted of about two hundred and fifty Wawemba, Ajawa, Afipa, Amambwe, Alungu, Atonga, Makololo, and Asora. The latter, about eighty, came over from the west side of Mweru.

From the south end of Lake Mweru, opposite Kilwa island, I struck south-west, coming to a fine and most picturesque range of mountains, called the Kunde-lungu. I travelled along the foot of this range southwards, at a distance of 40 or 50 miles west of the river Luapula. Reaching lat. 10° 48′ S., I struck eastward to the river, where I put the steel boat *Vigilant* * together. It had been sent out in sections. We had great difficulty in poling and dragging her up the continuous succession of rapids. The current was terrific, and eight Atonga men failed to make headway against it, though the boat was empty. Over and over again we were swept back down river at tremendous speed, after vainly breaking our hearts against the overwhelming rush of the enormous volume of water. Where practicable, the crew got out and hauled the boat over the worst parts. This constant battle only terminated at Chinama's boma, which I made to be 11° 13′ 49″ S. by Vega; but my observations were probably vitiated by the unsatisfactory artificial horizon I had to use, owing to having no quicksilver. Here I crossed the Luapula, and encamped about a mile south of Chinama's boma.

SWAMP NEAR LIFUNGA.

Negotiations had to be entered into with Mieri-mieri, the great Usi chief, and I passed sixteen anxious days at Chinama's, fully determined to cross the country to Lake Bangweolo through the Wa-usi, whatever it might cost me. Chinama was an awful old scoundrel, and gave me a heap of worry, trouble, and anxiety. He paid me a visit, before I crossed the river, with a very large armed force, which I returned. But for a long time he refused either guides or carriers. At last I sent to tell him that if he did not see fit to assist me in any way, and to cease putting needless difficulties in my path, doing all he could to prevent me from crossing to Bangweolo, I should look on him as an enemy. He collapsed at once, and sent me twenty men and two guides, one an excellent man who came with his wife, and ten Wa-usi. Four of the ten were tiny but plucky youngsters—Kalulu, Karungwe, Chibwe, and Mwana Kalune. I shall be very sorry to say good-bye to these four when the rains cease and they return homewards. I watch them from my verandah whilst I write, playing cricket, which I taught them (single wicket, of course), and which they love, rushing about, laughing and shouting, as happy as any little English boys at home. The ball, when they have done, is brought back to the verandah and put away. Then down they drop on their knees, clap their little hands, and rush away to hoe in their gardens. These four, with the four who wait at table and work in the kitchen, keep Chipamba alive with their merry laughter.

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* Sent out to him in sections by Mr. Leslie Sweet, 2, Bedford Row, and Woodham Grange, Horsell, Surrey.

LAKE MWERO.

Leaving Chinama's on August 12, we had a perfectly delightful journey across the plateau between the Luapula and Lake Bangweolo, though half frozen at night. One memorable night the thermometer went down to 36°. During the daytime, however, it was very pleasant. On the second day messengers arrived from Chinama's, begging me to return, and saying that the great chief Mieri-mieri was collecting all his Wa-usi to attack and shoot me. I sent back a message that I would return for no man, and that if Mieri-mieri attacked me, I would teach him to leave white men alone. It was an empty boast, for, though we could muster about eighty guns, we had barely a small handful of powder each. My own battery was, of course, well supplied. I daily practised my men to form up, so as to protect the loads in case of attack. The height of the plateau above the sea averaged 4000 feet, and the Wa-usi turned out to be very friendly, bringing presents of sheep, goats, and fowls. The country was beautifully wooded, and well watered by many delightful streams, but there was a total absence of game.

On the 20th we reached Miete, or Mewenge's boma, the chief of the north-western Wa-usi. The country inhabited by this people is so vast that it is divided up under different subordinate chiefs, who all acknowledge Mieri-mieri as supreme head. If they were united they would form a powerful nation, but this is far from being the case. Miete was friendly; and on the 23rd we started in high spirits. A pleasant walk through beautifully wooded country brought us out on to a narrow plain covered with cultivation. To the extreme right was a picturesque little boma, and beyond it a very blue lakelet called Chevinde. To our right front rose sand-dunes 100 feet in height. From the top of one of them, which I ascended, there was a view of the great lake. There it was—Bangweolo! stretching away to the north-east and east, an unruffled sheet of steely-blue water, glittering in bright sunshine. The coast to the south curved towards the north in two crescents. Our side was all pure white sand, with stunted trees and bushes; the country lying behind us forming belts of swamp, waist-deep in hot black mud and water.

Bangweolo deserves its name—there, "where sky and water meet!" They do, or they seem to do so, for there is seldom any perceptible horizon to be seen when standing on a level with the lake; and what colouring! An hour before to half an hour after sunset the whole scene is an exquisite blending of æsthetic colouring; and there seems to be a constant haze over Bangweolo which has a marvellously softening effect, while the blending of colours is at times indescribably beautiful. The water, up to 200 yards or so from the shore, is a sage-green, and further on it is the very clearest, purest, and most limpid blue. This evening there was a delicate salmon-pink flush diffused by the setting sun on the water, and there was no line to mark the horizon; the two elements, air and water, melted one into the other. Fringing the sandy shore of snowy whiteness is a mass of every tint of green, except where the line of sandhills rises, covered with dense scrub of a dull-green colour, almost blue.

Next day the camp swarmed with visitors, the chief event of the day being the unexpected arrival of Mieri-mieri's capitao, with a large suite. He brought me six fine ivory bracelets from the great chief, as a token of good-will. My camp was in a delightful position, topping a great white sandhill, about 100 feet above the lake. Mweru shores abound in small shells. Bangweolo, on the other hand, is absolutely shell-less. The sand of Mweru is much coarser than that of Bangweolo, and of a totally different colour, the former brown or yellow and coarse, the latter fine and pure white. Bangweolo is of no depth. I sounded in many places, but never got a sounding over 15 feet. Its surface is therefore usually still, a very strong wind raising but the smallest sea. It appears to me nothing but a flooded district. I fancy that it was formed by the water from the great watershed of the Tanganyika plateau, with its very plentiful supply, gradually overflowing the country at the base. The overflow has been checked to the west and south-west by a rim of rock; but the east and south-east have no such barrier, and in that direction there is a vast swamp from 20 to 40 miles in breadth. The Liposochi and Luena to the north, and the Chambeze to the east, are, it appears, the chief contributors to the water-supply.

VIEW OF KILWA ISLAND.

On the west the streams running into Bangweolo—and they are practically what we should term brooks—seem to radiate towards one inlet in the south-west. From this corner, round the south of Bangweolo, there is nothing to augment the volume of water.

Many islanders came across to visit us, and sell fish. They were very friendly. It is an extremely pretty sight to see six or eight men rushing a canoe through the water, which is still as oil as a rule. They use a long paddle, and work standing. At a distance they look as if they were standing on the surface of the lake itself. One can hear the swish of the water cleft by the prow of the canoe a long distance off.

In the afternoon of the 27th I paid a visit to Karoma's boma, paddling across the corner of the lake, a distance of 3 miles. He was away, but as the *Vigilant* neared the boma we saw the white sandhills swarming with natives, their black bodies being silhouetted against the snow-white background of sand. They all carried tufted bows, spears, axes, and guns. I cast an eye at *our* defensive weapons, and found they consisted of a bow and one arrow. I jumped on shore amongst the densely packed crowd. Karoma's representative gave the order, and down they all dropped on their knees, bending their heads close to the ground. It was a curious sight, looking over that sea of black heads. On hearing that Karoma was away, I stayed but a few minutes, and paddled back.

I found the height of Bangweolo above the sea to be 3765 feet, and the latitude of our camp, near the south-west corner, 11° 12′ S.—mean of four observations of * Vega; but I had no quicksilver, and had to use a looking-glass levelled with shot.

On August 30 I again left the camp, with twenty-five men, and received a hearty welcome from Karoma, who had returned. He said that Arabs had ceased coming his way; but I was greatly surprised to find that the natives did not seem to object to being sold. I spoke to the natives themselves, asking no end of questions, and their replies always came to the same thing—that they had no objection. Some professed great willingness, and even volunteered, to be purchased by me; but I told them we English did not allow people to be purchased—a bit of information which astonished them not a little.

Passing on our voyage, we reached Kavende point and encamped, being hospitably received as usual. I explored the island of M'bawala, about 20 miles long and 1000 yards from the shore, and shot some antelope after a long and trying stalk. Having spotted two fine rams on the opposite side of a sheet of water, I crept along for some distance with two boys; but the rams saw us and cantered away, then halted to gaze at us. Emerging from the water across which we had waded, we went on through the thick, black, hot smelly mud, and crept cautiously up a slight rise. I then let drive at over 200 yards. The antelope walked slowly a few paces, and then dropped. The native fishermen came willingly to help us to carry it to the *Vigilant*.

Next day we proceeded through a labyrinth of papyrus islands towards the outlet of the Luapula. The water was very shallow, averaging 4 feet, motionless as oil, and its surface covered with myriads of purple, lilac, and white water-lilies—some with light green leaves, others bronze-coloured and blood-red on the under side. Nothing was to be seen in front or on the sides, but the tall papyrus. Panta point is the most eastern extremity of the sandhill and rocky rim, which continues round the west and south-west to the Luapula outlet. It is a well-wooded bluff about 50 feet above the lake. Here the people brought supplies of all sorts for sale.

LAKE BANGWEOLO.

Next morning we left Panta point, and reached the south-west point of Kirui island at 6.15 p.m., landing at Lupaku's boma, which is of good size and has its palisades at the edge of the lake. Surrounding it were high, almost leafless skeletons of trees called lipupu. They are of great use in strengthening the stockade of a village, growing quickly. It seems, however, to be more of a cactus than a real tree, for a hollow tube runs through the trunk, filled with white sap, which burns like euphorbia juice. It burns the skin, the remedy being the bark of the nkula tree ground to powder. This powder is used by the natives for dyeing their bodies, and also calico, a most lovely carmine.

We were heartily welcomed, and next morning I found the whole population squatting outside my tent, waiting patiently for my appearance. The chief, Inpako, was a delightful old chap, very friendly and chatty. He contemplated me with a smile that was a mixture of astonishment and amusement. He asked for nothing, and was delighted with what I gave him. He said that Giraud passed a night on shore here, close to his boat. He remembered nothing of him but his moustaches, which stuck out on either side. That was all I could gather concerning Giraud during my voyage round the lake. The man had vanished from the natives' minds, but the memory of the moustaches lingered still. I could not help thinking of the Cheshire cat in 'Alice in Wonderland,' which vanished all but its smile.

The position of the mouth of the Chambezi can only be guessed at, as there is a sea of papyrus round it. No one could suppose that there was the mouth of a river near. The natives told me that the water was too shallow for a canoe to ascend it in the dry season. It takes days to reach it through the intricate winding channels in the papyrus.

On September 5 I received a message from a chief in the north part of Kirui island, begging I would stay so that he could see me. I therefore sent the *Vigilant* for him. While she was away, I saw fourteen big canoes approaching our landing-place, and I asked Lupako who they were. They had come with presents. The chief, named Chimembe, arrived in the *Vigilant*, and was very friendly. They all seemed to be in great fear of a chief named Yombwe, of the Wena Luwumbu, who inhabited the north and west coasts of the lake from the Liposochi to the Chambezi.

The more I saw of the natives of the island of Kirui, the more I liked them. They were quiet, hospitable, exceedingly friendly, and most inoffensive. The island is low, beautifully wooded, well peopled, and cultivated. Sorghum, cassava, sweet potatoes, ground-nuts, beans, pumpkins, and some Indian corn, plantains, and bananas are grown and thrive. The islanders, as well as those on the coast, are great fishers, and the fish they catch (which appeared to me similar to those caught in Lake Mweru) form the principal article of diet. The fish are eaten with flour of the pounded sorghum and cassava. Ground-nuts, pounded up into a paste, with boiled pumpkin-leaves, are much relished as an addition to the *n'sima*, which is the name given to the flour of either maize or cassava. Both pumpkin and cassava leaves, when young, are excellent as a vegetable, resembling wild spinach in taste. The castor-oil plant, of course, flourished, but the oil extracted from it is not nearly so much in favour as that from the berries of the m'sikisi tree. These fine trees, of considerable girth and height, with great spreading branches and a mass of deepest green glossy leaves, are carefully cultivated by generation after generation round the shores of Bangweolo. I consider these, together with the mupundu, as absolutely unrivalled in beauty, as well as for the delightful shade they give, by any other trees in Central Africa.

I found that Kirui, in common with the other two islands, M'Bawala and Kisi, reared a good number of sheep, the broad-tailed kind, and goats. Nobody remembered any one who could remember any game on the island of Kirui.

On September 6 we left Kirui, with every expression of regret from the people. As for myself, the island will always have a tender spot in my heart. Crossing to the island of Kisi, a bit of a breeze sprang up about midway, so the canoes closed in on the *Vigilant* in case of an accident, they all being of the very groggiest, narrowest, leakiest, and smallest description. The paddlers begged the Atonga in the *Vigilant* to leave off singing, for fear of increasing the wind. How like our own sailors in the matter of whistling! In deference to their wishes, I ordered my crew to shut up. But it only took us about three-quarters of an hour to reach the east coast of Kisi. About halfway across I found only 11 feet of water.

VIEW OF THE LUAPULA.

On reaching Kisi we coasted south a little, making for a rise which I thought suitable for a camp, a little beyond a fair-sized village. Ordering my people to go on to the rise and form a camp, I landed amongst the villagers, who were all on their knees preparing to tota. The signal is given by the chief or his representative, and at each clap the hands, no matter how vast the throng, strike each other simultaneously. The scene was a perfect picture. An English homestead in the heart of Kent could not have presented a more peaceful, prosperous sight. In front of the village, which nestled amid a mass of lipupu and banana trees for about 100 yards back from the beach, there was a long stretch of beautiful fresh green grass—almost turf. On this many sheep and goats were browsing, tended by little mites in the garb of nature. All round, at the back of the village, were fields of grain and cassava, and about 500 yards to the left there was an enormous clump of trees called m'situ. Beyond this again was the hill on which I intended to form my camp. There were many small canoes drawn up on the sand, and numerous fishing-nets. The chief, whose name was Konjé, also remembered Giraud's moustaches.

The morning after my arrival there was an enormous gathering of natives at my camp, all squatted in semicircles round their headmen, and the whole in a circle round my camp. The women kept outside the male crowd, and chiefly came to do the bartering part of the business. The chief of the island was a very good sort, and took the most intelligent interest in my guns. His great joy was the "breaking" and "mending" of my rifles. People used to come and beg me to "break" my guns, so that they might see them "mended." Goodness only knows how far many travelled, or how many came, just to see this extraordinary bit of "medicine."

Kisi is not a bit like the island depicted on our maps. From the south for 6 miles it is the shape of M'bawala, U; then it broadens out to the east and west. Between the oblong bit and the widening out the island sinks as if it had been cut in half by the water. On the south side of this dip there are some high sand-dunes.

The oblong part to the south is about 1½ mile in width, and at the north end is the row of sand-dunes, covered with coarse yellow grass. Beyond the dip the ground rises, and is covered with scrub and a few trees of fair size. The southern oblong is flat, and a mass of cultivation, with many fine msikisi trees dotted about. From the top of the dunes I could see the western coast of Bangweolo, at a distance of about 15 miles.

On the 10th I walked across Kisi to the west coast, to take the sun with the lake horizon, the looking-glass and star business breaking my heart. I was walking along, buried in thought, when I heard a soft clapping of hands to my left. Looking in that direction, I saw a comely, middle-aged matron totaing and smiling amidst her cassava. Her coiffure was coloured red with ukula and oil, and bright with beads. She wore many bright iron bangles as ornaments, and was clothed in mitai (bark) cloth dyed with ukula, and neatly embroidered with patterns sewn with light-coloured grass, which in the sunshine shone like gold thread. Her neck was encircled by two or three rows of beads, amongst which I recognized some I had introduced on the island. She had risen from her knees, and was regarding me with great curiosity and, I trust, admiration, when I turned my face to her and, smiling, said, "Good morning, mother." The buxom dame's face simply beamed. Down she flopped on her exceedingly well-covered knees, and announced, her face rippling over with smiles, "I am the wife of Chamata." I cannot say that the information interested me particularly, but I could not help congratulating Chamata, whoever he may have been, on the possession of a lady so evidently proud of being his spouse. I had, until that moment, been of the opinion that marital fidelity round Bangweolo—well, the less said about it the better.

JOHNSTON FALLS.

I reached the west coast, and stationed myself on an anthill as close as I could to the water's edge, so as to be able to guess my height above the lake-level fairly correctly. By degrees a big crowd came from a boma close by, and sat round the ant-heap in dead silence. I took readings for a long time, judging my height above the lake to be 12 feet. The resulting latitude was 11° 3′ S. In the afternoon I went in the *Vigilant* to photograph what I could see of M'bawala from Kisi. Landing about a mile from the south point, with my capitao Sapora carrying the camera, I happened to remark, as I walked along, that it was odd we had come across no hippo pits. "We did," he replied, with a smile; "for you walked over the top of one. It was too late for me to call out, for you were walking so fast in front; but, seeing the ground bend under you, I walked round it." Wise man! I thought, especially as he would scale a couple of stone more than I do.

It was a perfect evening. Such a sunset! there was a warm red glow cast by the sun over everything. M'bawala and Kirui, to the south and east respectively, floated in a quivering haze. Lake and sky melted one into the other, forming a vast expanse of most exquisite blue. The islands were a tone deeper blue, with touches of buff-coloured sand here and there, lighting up the shore. My path led through masses of cultivation, chiefly cassava, with its bright green leaves and ruddy brown stems. Dotted about were huge msikisi trees, with their dark green glossy leaves and abundant masses of shade, a striking contrast to the vivid emerald green spread out around them. Close to the shore were three or four unenclosed villages, nestling amid bananas and lipupu trees. Scattered about, in groups and singly, were natives enjoying the pleasant warmth amongst the high-roofed, neatly thatched, roomy huts. The thatch is nearly chocolate-brown at the apex, gradually becoming lighter, till at the base it was almost silver. These roofs are perfectly lovely under the light of the full moon, the softness of colour being indescribable. Nearly all the people, young and old, were employed in some way or other, making and mending mats, beating out the bark of the mitai trees into cloth, carving pipe-bowls, mending bows, smoking or chatting. The women were trooping in from the fields, carrying pumpkins, cassava, bundles of firewood, or calabashes of water from the lake, all loads being balanced on their heads. The sheep and goats were being driven homeward to be penned for the night.

Happy little island, and happy islanders! War never comes nigh them. They know nothing of the outside world. They seem to wish for nothing. Why should they? they have all they want. May it be centuries before civilization, with its innumerable attendant evils, finds out and robs little Kisi of the peace and contentment it now enjoys!

While I was away from the camp, the chief M'Bulu came and left a message to the effect that if we heard drums beating at night, we were not to think it was war; it was only because his mother was just dead. Now, I call that real thoughtfulness.

I paddled back to camp in the *Vigilant*, close in shore. In every direction were canoes fishing or returning with their hauls. The reflections in the unruffled surface of the lake were marvellous. Canoes and canoemen were mirrored as in a looking-glass. In the soft haze, which made it impossible to distinguish water from sky, canoes and the islands of Kirui and M'bawala appeared as if suspended in mid-air. The islanders crowded to the water's edge opposite their bomas, to see the *Vigilant* paddle past, and as each crowd knelt in its turn, the sound of hand-clapping came to us over the water.

At 4 p.m. of September 9 we left Kisi, a huge crowd assembling to bid us farewell and entreat us to return again. At 6.15 we landed near Kasitu's small boma, on the northern part of Kirui. I was sleeping soundly, when I became conscious of a voice at my tent door, saying, "Chief! Yombwe has arrived." He could not have come at a more inconvenient time, as there were only eight men in the camp. The only thing to be done was to brazen it out. After having got my presents ready, I sent word to say that I was willing to receive him. As he approached, I pretended to be engrossed in a magazine, perfectly oblivious of anybody or anything in the vicinity. I thought it more diplomatic to receive him in a stand-offish fashion, as any eagerness to meet him might have been misconstrued into anxiety for his friendship. As a matter of fact, I was anxious for his friendship, but I was not going to show it. Keeping one eye on my book, and the other on Yombwe and his crowd, I noticed with a sense of relief that they were unarmed. When close to my chair, I put down my book carefully, got up, and, holding out my hand, said, "Good morning, Yombwe." He was of most unprepossessing appearance, and obviously ill at ease in my presence; about fifty years of age, below medium size, with small cunning eyes. He was the terror of Kirui and the surrounding country, though but a poor specimen of humanity. He was, however, very friendly, and is perhaps not so bad as he is painted.

VILLAGE NEAR KISI.

I started again on September 11, the water being very shallow, and the breeze coming over the reeds sounded like an angry sea. Away to the north-east and south stretched a vast expanse of reeds, and to the north there was a line of blue hills, evidently the boundary of the lake. After some difficulty, we landed on an island among the reeds, the happy possessor of a really fine tree, and here we encamped. This island, called Kohoto, is only about 250 yards long by 30 broad. The line of hills, one unbroken semicircle, stretches away to north and south, about 5 miles distant. It was, however, quite impossible to get through the marsh to them.

At 5 a.m. on September 10, one of my Atonga came to say that a couple of lechwe antelope were feeding in the marsh to the north-east. In I went, the water feeling icy cold, and we kept as low in the water as we could, to hide ourselves. I returned to camp with both; unfortunately, two does. We then started, paddling along the lanes of open water in the reeds, passing a long msitu or clump of trees, which the natives say lies opposite the mouth of the Luena, at the end of the lake. We continued to traverse a sea of reeds, getting glimpses of the open water about a mile to the south; and at 3 p.m. we emerged opposite to what appeared to be a spit of land running out from the mainland, about 2 miles distant. At 4.20 p.m. we landed on it, finding it to be of sand and well wooded. To the west of this spit there was a beautifully calm bit of water called Chilipa, and beyond were miles of marsh and high papyrus reeds. A broad belt of reeds separated Chilipa from the open water of Bangweolo. Great numbers of whistling teal frequent this northern shore, but they were most extraordinarily wild. They are most beautifully marked little birds, the colouring of their plumage being perfectly lovely—gold, green, black, white, and chocolate, shining like enamel in the sun. While my men were pitching the camp, I went to explore, and found that the supposed spit was an island. The north point is about 1½ mile from the shore, where the hills come down close to the lake. At their base there is a sweep of golden sea-beach, both hills and country at their base being well wooded. The island is called Ivula.

At 8 a.m. on September 13 we left Ivula island, and met with a strong breeze and choppy sea, which threatened to swamp the small groggy canoes. We passed another long island called Chimbo, some hills appearing beyond. We were now at the north-north-west corner of the lake, and could see the coast, with its blue line of hills, sweeping away round to the south as far as the eye could reach. At the north-north-west corner there was a mass of huge reeds, which was pointed out to me as the mouth of the Lipososi river. Passing this mouth, we landed and encamped at a nicely shaded spot. From this place I made an excursion with the canoes after antelope, getting a fine view of the vast swamps from the top of a rise where I landed. Trudging through deep white sand, we at last sighted a herd of *lechwe* antelope about a mile distant. To our right were some pools literally swarming with Zambezi geese, duck, teal, and black ibis. I was obliged to leave them in peace, for the sound of a shot would have put the herd of lechwe to flight. I made my way towards them across a swamp, but there was not an inch of cover, the reeds all lying flat. The water was waist-deep, brown, and smelly. When within 600 yards, they started off at a canter, and were soon mere specks in the distance, going northwards. Returning, I regretted every step I had taken, and my feet stirred up the black mud, causing myriads of little bubbles to rise to the surface and burst, giving forth an abominable stench. The sun, too, was glowing like a furnace. When I reached the land I was a wreck, soaked from head to foot in smelly water; and as regards temper—well, I was not pleased. However, I got back to camp, and whilst having a clean, the chief N'sombo was announced—an oldish man, lean and quiet, and blind of one eye. I made the latitude of my camp by * Vega, 10° 32′ 24″ S.

LADIES AT CHIENJE.

On the 15th I went across to Chimbo island after hippo, but failed to get a shot. They are exceedingly scarce, being eternally hunted by the lake-dwellers. I only came across them at two places, the south point of Kisi and Chindo.

On the 16th we started again, the coast being very pretty, the hills coming down to the water's edge, well wooded with stunted shady trees, a narrow belt of short reed fringing the water close in shore. In the afternoon we encamped on a sand-knoll, 30 feet above the lake, whence I could see the trees of Kisi, blurred in the heat-haze. We were on a narrow peninsula, stretching as far as I could see north and south, and on the west side of it there was a sheet of water, partly filled with reeds, and about 3 miles in width. The peninsula is called Lifungi, and the sheet of water Chifumauli. It extends the whole length of Bangweolo north and south, always separated throughout its entire length—some 30 or 40 miles—from the lake by the Lifungi isthmus. Latitude of the camp by * Vega, 10° 44′ 54″ S.

I had the *Vigilant* and canoes dragged across the isthmus into Chifumauli, about two hours' hard work. Lifungi is from 400 to 600 yards wide, all hill and valley, formed of white sand. The water of Chifumauli was sapphire-blue, the beauty being enhanced by beds of yellow-green reeds. The heat was very great—100° in my tent. From the shore of Lifungi I was looking at the water of Chifumauli, when, about 500 yards off, a huge black head, like that of an enormous snake, rose out of the water. I was looking through my glasses at the time, and it was with great difficulty I could keep them on the reptile, at the pace it was travelling. It would dive and come up fifty or a hundred yards from where it disappeared, travelling at an incredible pace under water. The natives said it was a *nsoto* (python) after fish. If I come across another, I hope it will not be whilst bathing. I spent the whole of the afternoon of the 18th after butterflies.

Continuing the voyage on the 19th, we passed along a very fertile-looking country, well wooded and cultivated, with many villages, a low line of hills giving way to very steep cliffs of red soil about 20 feet high. Arriving under a village perched above us, called Kalaso, we ran the boat on shore, and climbed to the top by a steep path, where we camped.

On the 21st we again started along high precipitous cliffs of a light red, covered with dense foliage, with many bomas and villages looking out over the unruffled surface of the lake, like a sea of glass. Eleven and a half feet was the greatest depth I obtained sounding, which I did frequently. At last the high steep bank gave place to low land, thickly wooded, the shore scolloped out into numbers of little bays with rocky points. This part of the coast was very thickly populated.

On the 22nd we reached the southern extreme of Chifumauli, and dragged the *Vigilant* and canoes back into the lake. Lifungi is almost entirely wooded with the muntufita, which gives delightful shade, is very picturesque, but does not appear to be used for any special purpose by the natives. There are also the mulama si chanchi (or mukovi), which exudes beautiful crystal-clear gum, very soothing to the throat, and with a pleasant taste; and the tumiowa tree, which gives good shade when fully grown, and possesses a round hard-shelled edible fruit, green when unripe and gold when ripe. This fruit has always been a perfect godsend to me, who love anything in the shape of a ball to play with. It has enlivened many an otherwise tedious hour—shooting at them with the rook rifle, when swinging by a string or balanced on the top of a reed; or playing at catch-ball with my boys. The temptation to pluck those hard green or yellow balls, which grow in hundreds on each tree, from the size of a tennis to a cricket ball, and as round as either, and shy them at something or some one, is perfectly irresistible. Their weight, especially the green ones, is perfect for throwing. I have seen many an apple fight, and have had ample opportunities of testing their hardness on different parts of my person, but for force on impact commend me to the fruit of the tumiowa tree.

But this is a digression. We were now near the headquarters camp whence I had started. At 1 p.m. we set out for home, the pace of the *Vigilant* being about 4 miles an hour. The prevailing wind of Bangweolo is from the east. In spite of the vast marshes surrounding this lake, and the constant visits of Arabs in past years, no rice is grown. There is cotton everywhere, but not in any large quantity, and the bark-cloth tree abounds.

At four we paddled in to the shore beneath the camp, amid a scene of the wildest enthusiasm and excitement. When I first saw the men, they were drawn up in two long lines, on either side of a broad road they had made from the camp to the lake, and the drums were beating merrily. Arriving fairly close, a man here and there would rush out of the line, and, after executing a dance, would return to his place. As soon as the *Vigilant's* bow touched the shore, all discipline was thrown to the winds. The crowd rushed down in a great wave, shouting and dancing. They surrounded the boat, and all endeavoured to seize my outstretched hands. I could not utter a word to save my life. From the boat to the sand my legs and arms were being caressed by scores of black hands, all anxious to touch me or something belonging to me.

I found that during my absence they had made a most excellent square boma on the site I had originally marked out. The huts all had mud floors and raised beds. Mine looked delightfully cool and clean. I told the men I was exceedingly pleased with their work, and with the way they had behaved themselves during my absence.

There was a huge gathering of natives from all round the district to welcome me back. This completes my account of the circumnavigation of Bangweolo and Chifumauli.

After the reading of the paper, the following discussion took place:—

Mr. Alfred Sharpe: I am sure we have all listened with very much interest and pleasure to the paper which has just been read by the President, and which he has compiled from letters written by Mr. Poulett Weatherley. It has a special interest for myself, as I have travelled through a portion of the country described, viz. the Mweru district. With regard to the name "Bangweolo," I must confess I have always felt somewhat sceptical. As the President has said, I have always believed the name to be simply "Pa-mwelo," which means "at the lake." In, at any rate, this part of Africa, there is no special name for any lake. "Tanganyika" does not really mean any particular lake, but simply a large piece of water. "Nyasa," "Nyanza," and others are the same. I cannot call to mind any lake that has a really distinctive name of its own. I am sure we cannot have listened to this paper without feeling that Mr. Weatherley possesses qualities necessary for successful travel in the regions he has described, patience, perseverance, sympathy with the natives, and consideration for their feelings. I know, from what I have experienced myself, that without some measure of these no one can travel successfully in Africa; but with an abundant supply of them, I believe that one can travel from north to south of the African continent. There is one point I should much like to allude to to-night, which has not been spoken of in the paper read. Mr. Weatherley visited the spot where Livingstone died. He was not the first to visit that spot since Livingstone's death. The first man who went there was Henry Glave, who crossed Africa and died on the West Coast. After him came Mr. Weatherley. Since then one or two others have visited the spot, the last being Mr. H. Genthe. From the accounts given by all these travellers, there is no doubt whatever that the mpundu tree, on which is the memorable inscription to Livingstone, is practically about to fall. Once that tree falls the inscription is lost for ever, because in Africa dead wood is destroyed almost immediately by white ants. That being the case, I should like to suggest that the Royal Geographical Society take steps to have cut out of the tree the section which contains the complete inscription, and that it should be sent home and placed among the other relics which the Royal Geographical Society possesses. It would not only be an interesting reminder of Livingstone, and the great work that he has done in Africa, but it would also be some evidence of what African natives can do; it would be a record of the love and regard which they must have had for Livingstone, when they carried him so many miles, and brought him to Kabenda, where he died. Should anything be done to carry out this suggestion, I may say that I am returning to Africa in a few months, and should be happy to aid in any way I can to carry out such plans.

The PRESIDENT: Perhaps Mr. Sweet, who is the friend of Mr. Weatherley, and sent him out his steel boat, the *Vigilant*, may be induced to give us the interesting little incident concerning the smelling-salts.

Mr. LESLIE SWEET: I expect the President could tell the story better than myself. It was on one of Mr. Weatherley's previous journeys in Central Africa that he was attacked by a hostile tribe, and he and his followers practically lost everything that they had got. Mr. Weatherley only just escaped with his life, and wandered about for some time with nine or a dozen of his followers. Ultimately he came to a settlement, where he was received in a very unfriendly spirit. But he happened, luckily, to have with him a small bottle of smelling-salts, and by means of this bottle he kept his followers and himself in food for a week or ten days. The natives would come to him for a sniff of the bottle; they seem to have considered it a charm of some kind, and for each sniff they had to pay a certain amount of food. That is the history of the bottle of smelling salts.

Sir HENRY H. HOWORTH: I did not come here this evening with the intention of speaking—indeed, I am hardly prepared to deal with the subject of the paper; but a remark made by my friend on the left (Mr. Sharpe) has tempted me to add a slight suggestion. It has always struck me that those who travel so much in Africa, and explore so many parts of the country, ought to do a little more than they do to try and bring us more knowledge of, and make more interesting to us, old African history. Then we are told that the inscription on this famous tree is in danger of being destroyed, and that it should be removed and brought back to England and made a record in this Society. I think the Society would do well, also, to try and get the inscription replaced somewhere in the old ground. It would be very interesting to all visitors to the spot in days to come, and would form evidence of the history with which the spot is associated. We in this country are very much in want of a knowledge of the real history of Africa. We who are much interested in the ethnology of Africa are terribly puzzled by the want of real records.

And now may I digress for a moment to say, Mr. President, how pleased we all of us are to see you here again in your place looking so well, and to hear again that vigorous voice that we all like so much to hear? It pleases us all to see you again in good health. And now let me go back to what I was saying. In the old days when we were all children, we used to read the 'Arabian Nights' with the greatest delight, and especially the story of Sinbad the Sailor, which occurs in the 'Arabian Nights,' and occurs also as a separate Arabic book altogether. It is a wonderful and interesting book, because it is a narrative—an account and a description of the travels of the old Arabs in the time of Haroun-Alraschid. It was upon the shores of some of these African lakes and on parts of the eastern coast of Africa whence the Arabs drew most of their slaves. They travelled from the coast of the Mediterranean right down to the Zambezi, and they seem to have gone across country as far as these lakes. We have really a great deal more information about these Arabs and their travels than most people suppose, and I think it would be an important and interesting thing for a rich body like the Royal Geographical Society to make a collection of the old Arabic accounts of the different parts of Africa which have been explored by Englishmen. There are some wonderful stories about all this coast, and some of the old African slave-dealers went further inland from the coast than some of us now suppose. All down this coast we find a peculiar dialect, which is really a mixture of the old Arabic with the old native languages. I have recently been staying in a country house with a gentleman who has spent twenty-five years on the East Coast of Africa, and has gone up to these lakes frequently, and he tells me that in nearly all the huts of the natives can be seen some memorials of the old Arabian traders in these parts. I think he can date the voyages of many of these Arab traders by the remains we have now left, which are in the hands of the chiefs. There are to be seen some very curious old pieces of Chinese porcelain, which were brought over in the tenth or twelfth century by these Arabian traders. Of these Sir John Kirk has made a curious collection, hardly any of them being later than the twelfth or thirteenth century, when the Arabs ceased to have the command of the Indian ocean. From what I have said, it would appear that it would be undoubtedly most interesting for this Society to make a collection of the Arabian accounts of the eastern parts of Africa, and especially of the country reaching up to the lakes. I have felt very much that we are apt to forget the human interest that attaches to these districts. There is a famous old Arab writer who wrote a history of Egypt, and gave a very extraordinary account of the migration of the Zulus (?) from a country much further to the north. It is so detailed and interesting a work, with such graphic narratives, that I think it would be well worth our while to get together the whole of the stories as told by these Arabs. They would certainly help our own explorers in their discoveries in these regions of Africa. We have had a wonderfully graphic account in this paper to-night, but I do think it would be interesting if we could make a little headway into the earlier history of this great continent, which really enshrines the first phases of all human history, for all the earlier history of the white people, the brown people, and the olive-coloured people is derived from the black races. Traces of this can easily be found down this coast and partly across the whole continent, and through the Sudan and part of Egypt. I do feel that the human element is often a little too much forgotten. I am sure we are all very grateful to Mr. Weatherley for the most interesting paper he has given us to-night.

The PRESIDENT: I shall have great pleasure in bringing to the notice of the Council Mr. Sharpe's interesting suggestion and Sir Henry Howorth's very supplementary remarks. I think we must have been all struck by the pre-eminent fitness of Mr. Weatherley for the work he undertook. First of all, I think we admire his kindness to the natives, his warm sympathy with them, and his keen anxiety for their welfare. We have also been equally struck by his perseverance. This perseverance is especially exemplified by the trouble he took with his observations, when he found himself without any quicksilver, and had to use a looking-glass levelled with shot. That was an operation that would require more patience than any other that, I think, we can imagine. It may appear to be a very small thing, but it is one among many proofs of his perseverance. He was absolutely fearless, warm-hearted and kind to the natives, and he possesses most remarkable determination. We and all the Fellows of this Society are very pleased to reflect that the Council selected Mr. Weatherley for the grant of one of our awards this year, for his eminent services in the exploration of Lake Bangweolo. For when we ask Mr. Sweet to convey to Mr. Weatherley the cordial thanks of this meeting for the interesting paper he has forwarded to us, and for his most valuable collection of photographs, I hope it may be some comfort to him in his loneliness to know that he is not forgotten by the Fellows of this Society, and that we take the first opportunity of recognizing his valuable geographical researches.

THROUGH TIBET TO CHINA.*

By Captain M. S. WELLBY, 18th Hussars.

BEFORE telling of our journey, that is, of the journey that Mr. Malcolm, of the 93rd Highlanders, and I made together, in 1896, it will perhaps be well to compare our routes with those of other travellers. Colonel Prjevalsky had attempted to reach Lhasa, starting from the Tsaidam. Bower started from the west, at the pass Lanak La, and at once struck a direction south-east to Tengri Nor. Two years before this, in 1889, Prince Henry of Orleans and Bonvalot made a journey from Lob Nor to Tengri Nor. In 1894, the Littledales made their famous journey, starting from Cherchen, arrived within 50 miles of Lhasa. Rockhill's wanderings had been restricted to Eastern Tibet. Thus it will be seen that none had attempted Northern Tibet; it had only been crossed in the eastern portions, and there lay several hundred miles absolutely unexplored.

Our main object was to traverse this unknown land, and to try and discover what lay beneath that mysterious word, "unexplored." We also announced that we were bent on finding the source of the Chu

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* Read at the Royal Geographical Society, June 9, 1898. Map, p. 336.

Ma river, a tributary of the Yangtse. Throughout the journey across this land we generally followed valleys, nullahs, and dry beds of rivers. After marching some 120 miles from Lanak La, we saw immense snow-ranges, running east and west, both north and south of us. The north range was particularly conspicuous, with an abrupt massive peak. Our maps will describe the country best, but it may be as well to mention the fine snow-peaks that lay some 20 or 30 miles north of us when on the banks of the river Chu Ma. For four months we saw no vegetation higher than an onion, and for nearly four months we were at an average height of 16,000 feet. For more than fourteen weeks we were without seeing any sign of mankind, and should have been a deal longer, had we not providentially met a Tibetan caravan travelling at right angles to our route, on their way from Lhasa to China. The distance we covered from Leh to the Chinese frontier town of Tankar was very nearly 2000 miles; it took us nearly five and a half months.

We made our start from Leh, the capital of Ladakh, where we spent a week or so collecting our caravan, receiving every assistance from Bishan Das, the Wazir of Leh, and from Captain Chenevix-Trench, the Resident at Srinagar. At this time of the year, namely, the end of March, men and animals are scarce in Leh, for the season is not sufficiently far advanced to allow of merchants journeying in from the north. Leh itself was comparatively empty. By a stroke of good fortune, a certain merchant had lately arrived from Lhasa, and from him we purchased the nucleus of our transport.

Our caravan, when completed, consisted of twenty-two mules and seventeen ponies. Some of these latter were in very poor condition, while the former had no cause to boast of their appearance. They carried 28 maunds of bhoussa (or over 200 lbs.), or chopped straw, and 18 maunds (over 1200 lbs.) of grain, and four and a half months' rations for all our men. In Leh three distinct kinds of mules are obtainable, namely, Yarkandis, Ladakhis, and Lhasa or Chang Tanis; of these, the former are by far the most taking in appearance, and are mostly very big, standing 14.2 to 15 hands. They are, however, unfitted for a long journey, when grass is likely to be scarce, and only a limited quantity of grain can be carried. The majority of these mules are black in colour. The Ladakhi mules are mostly brown; they are generally extremely hardy, able to stand great cold, and to do a lot of work on inferior food. Unfortunately they are hard to obtain, as only a very small number are bred, and some are too small to be of much good. The best of all are the Chang Tanis, bought in Leh; the very fact of their being there shows that they have been able to perform a long march with loads on their backs. They require little or no grain, and are very hardy. Yarkandi merchants, as a rule, give their mules loads of 200 lbs. to 240 lbs., and about 4 lbs. of grain daily; the Lhasa merchants put about 160 lbs. on their backs, and when grass is plentiful, give no grain.

Our followers were composed of six Argoons and two Yarkandis as drivers; an Argoon cook called Lassoo; and a Ladakhi servant called Esa Tsareng, which we simplified into "Esau;" and lastly our sub-surveyor, Duffadar Shahzad Mir XI. B.L., who throughout worked with the plane-table most perseveringly, while we took the latitudes and heights. There was also with us my little fox-terrier Ruby. Even in Leh we could place but little faith in our men; but as no others were forthcoming, we were entirely in their power, and could only induce them to start at all by humouring them in every way and complying to all they asked for.

Without doubt we were starting too early in the year, for most of the passes were closed by snow; yet it must be remembered that a late start may result in winter setting in before the plateau is crossed. For this reason we could not take the direct route across the pass Chang La to Lanak La, where we wished to cross the frontier. In fact, the only way open to us lay in working our way round to Shushal, on the Pangong lake. This road we took. I shall never forget the day of departure from Leh. As soon as the signal was given for the gates of the serai to be opened, the loaded mules and ponies, who had done nothing but eating for the last few days, with one accord rushed down the main street of Leh. Some took advantage of open doors and went inside, others discarded their loads altogether, while men, women, children, and dogs all joined in the general uproar. A short way from the town the road makes a sudden dip, and here the crowd of friends and relatives of our men, not relishing the return journey, bid their last farewell amidst much weeping, whilst the more generous-hearted of the muleteers scattered small change amongst the young fry.

At Shushal, where we completed our stores of bhoussa and grain, our difficulties began. No one could, or rather would, tell us of a road running eastward. The direct route over the Marsemik La into Chang Chemmo was closed by snow; but, looking at the map, it appeared that still two other routes remained—one by the northern and one by the southern extremity of the lake. We knew quite well that the southern course would be impossible, for the strong guard maintained at Rudok were certain to turn us back for good and for all. It did, however, look feasible to find a crossing between the two lakes. We sent Esau with another man, mounted on ponies, to find this out; but they were soon stopped by a strong armed party from Rudok, who were well acquainted with our every movement, and fully determined to oppose any attempt in that quarter. We therefore adopted the only course left, and marched northwards along the shores of the lake to Lukung. From here we found the only route open was one to a place called Niagzu. A journey with two passes and of three days without water. It was a cruel beginning to contemplate for our mules, but with the help of hired yak we accomplished it without mishap. Niagzu is looked upon by

Tibetans as a boundary-mark between Ladakh and Tibet. It is a snug spot, with a fresh rivulet and thick brushwood abounding in hares, while antelope and kiang (wild donkey) resided in some of the adjacent valleys. This brushwood was the last we should set eyes on for four months. Thence we journeyed on eastwards for some days to Lake Treb, with a guide to show us the way. This lake is of a beautiful blue, and saltish. Ladakhis come as far as this to collect the salt, of which there is abundance, and Tibetans take their ponies to drink the water for its medicinal qualities. The lake shows signs of having considerably dried up as years go by, for the banks sloped down in terraces to the water's edge. This I believe to be the case with many lakes in Tibet.

Lake Treb lies at the foot of a pass called the Napu La, which we made out to be 19,300 feet high, water boiling at a temperature of 179°, with temperature at 40·6 Fahr. at the summit. The crossing of it is a stiff climb for loaded animals, and would be altogether impassable after heavy snow. On descending the other side we found a fine glacier, and camped at the foot of it. At this point our hired transport left us to return to Lukung, and afterwards we only had ourselves to depend upon. We found a broad well-watered valley running east, while on either hand were occasional grassy nullahs, wherein dwelt goa and antelope, and numbers of ovis ammon heads lay about. As we marched down this valley we overtook two or three Tibetans, and, having won their friendship by means of small presents, persuaded them to act as guides. They informed us that if we continued down the valley, we should enter a district called Rundore, and there meet with opposition. They were astonished to find we had come so far without encountering anybody, and only accounted for it by saying that many Rundore men had been summoned to Rudok to strengthen that post, for news had reached them of a strong expedition setting out from Leh in that direction. Nevertheless, they agreed to take us up another valley running northwards, called Kerambutabuk, and thence east as far as the Mangtzatso, and so avoid all collision with the Rundore men. This strategic movement was doomed to failure, for at our first night's encampment we were visited by some Rundore officials with an armed following.

These men were at first bent on opposing us, but finally gave way to persuasion, and just as we were congratulating ourselves upon our good fortune, another strong party of officials from Rudok rode in, in hot haste, determined to stop us. Bribes, threats, and arguments were of no avail. They insisted upon our returning by the way we had come. Throughout the night fresh arrivals continued to pour in, and the jingling of the bells on the ponies' necks proclaimed at what a rapid rate they rode. At daybreak we found quite a big gathering, armed with spears and matchlocks. In an ostentatious way we loaded our mules and our guns, and, distributing them to our followers, endeavoured to get past. But the Tibetans, whose actions and feelings were those of fanatics, were not to be so taken in. Back we had to go, and, without hired transport, to recross the Napu La, back to our old friend, Lake Treb. At the corner of the Kerambutabuk nullah where it joins the main Rundore nullah, was a small nomad encampment called Kerinagar. These people lived in some very dirty and dilapidated old tents, and possessed a little grain and a few sheep. Close by was a hill called Chotenchenbo, conspicuous amongst a chain of others. The hill is probably volcanic, as these nomads informed us that every month much noise was emitted from the summit, which has so worked upon their imaginations that they hold it in the deepest veneration, and on the 15th day of each month, numbers of people from the surrounding district come to worship and propitiate the spirit of the mountain.

From Lake Treb we travelled north to the east side of the pass Lanak La. Since leaving Leh we had traversed 397 miles, had lost two ponies from exhaustion, and all our sheep but one, yet we had only just reached the border of Tibet. This solitary sheep marched for several weeks to come, and very often, when game was scarce, his life was in jeopardy; he was friends with everybody. One day, however, he had to be killed to supply mutton broth for one of the men who was seriously ill. But, owing to his daily tramp, the flesh, we agreed, was the hardest and toughest we had ever tried to eat, and I am sorry to say the mutton broth possessed so little sustenance that the poor man died. But here we received an addition to our party, in the shape of Ruby's litter of three pups. Our men, too, at this spot, were exhibiting a grumbling spirit, and were hinting at turning back; fortunately, Malcolm shot a yak, and their minds, for the time being, were fully occupied in cooking and eating an enormous amount of flesh.

On May 31 we at last launched forth over northern and unexplored Tibet, which is known as the Chang. We had hoped to find either Bower's route or the Polu road before taking our own course, but our reconnoitring availed us nothing, so we resolved to strike a road for ourselves. We decided, whenever possible, to march due east, and when in doubt to travel north rather than south. We started over an easy pass, and on the other side found a broad valley running east, and camped in it the same evening, by two small pools of fresh water, though there was next to no grazing. Throughout the night a violent storm raged. We could hear our mules entangled in the guy-ropes of our tent in their eagerness for shelter, and every moment we expected to be buried in snow and canvas. On rising at daybreak, a death-like silence prevailed, so still it seemed after the previous night. Stepping outside, I found all was clothed in snow. The men were quiet in their tents, and some of the mules stood with drooping heads, and others lay outstretched; but, on counting them over, several were deficient, and the poor fellow who had nearly brought the tent down on our heads lay stiff and dead. I woke up the camp, and, selecting our best men and ponies, sent them off to track the strayers before the snow melted.

I will now pass more quickly over the next two months. Throughout the month of June we continued to travel eastwards. Our animals died at an alarming rate, so that Malcolm and I had to give up all idea of riding. Generally speaking, our route lay along broad open valleys some 16000 feet high, and after every four or five days, we would cross an easy pass into another wide valley. It was clear that the range of mountains ran east and west, and it struck me that the difficulties of travelling north and south must be great. The land abounded in salt lakes and salt districts, making fresh water very scarce; in fact, almost daily we had to dig some feet deep, before we could hope to find any. This want, added to the scantiness of the vegetation, told severely on our animals. By June 22 twenty-three of them had died, and some of the remaining sixteen were in a very weak condition; yet, since leaving Lanak La we had not come 200 miles. In some places we found grass just beginning to sprout, showing the advantage to be gained of making a later start in the season, if possible. In others we found "boortsa" growing, a kind of heather. In this there is certainly a great deal of nourishment and saline moisture. Most of the animals generally preferred it to grass, and required less water when it was plentiful. Our ponies gave way before the mules.

On June 9 we camped on the banks of a fresh-water lake, frozen over. As we had to lighten our loads here by leaving goods behind, we christened the lake, Lake Lighten. On June 18 (camp 32, height over 16,000 feet), we found a small white butterfly. At these high altitudes, it was astonishing to find the thermometer registering as much as 110° Fahr. in the sun, while at night-time there were sometimes 25° of frost. Very soon after sunrise the heat became most oppressive for the mules and ponies, and, in order to husband their strength, we used to rise at 3.30 a.m., and march half a dozen miles, and again make a second march in the cool of the afternoon. During this month game was scarce, but towards July things began to improve. Game became more plentiful, especially yak, some of which, on one occasion, were even grazing with our own mules. Salt lakes became rarer, there was better grazing, and we were able to add to our collection of flowers. On July 12 (camp 52), we saw eagles and wild dogs. On July 19 (camp 59), a week later, we found a brown butterfly.

On July 22, just after leaving camp 63, we crossed a narrow track running at right angles to our route; this was well defined, and perhaps a road to Lhasa. On the track, one of our men picked up the entire leg-bone of a pack-animal, showing clearly that a merchant or traveller must at some time or other have used the track, for there was a shoe attached to it, and nomads do not shoe their animals. This track ran along the western edge of an ancient dry bed of a salt lake. The lake was remarkable, for it was divided into small squares by walls of crystallized salt, 2 to 3 feet high. The salt was of excellent quality.

On July 27 (camp 68), we crossed a river, which took its rise from the hills close by. The bed of it was half a mile across, with several small streams a foot deep, and it was the largest body of running water we had met. Everywhere grew good grass, flowers, wild onions, and other vegetables—"kumbuk" and "hann." Yak and antelope were abundant.

Throughout this time we had experienced a good deal of trouble from our muleteers. We could not make them realize that our only chance of crossing this unknown land lay in taking every care of the mules. Our arguments and promises of rewards bore fruit for a few hours only; the slightest reverse would again exhibit a lazy and unwilling spirit. Besides, they quarrelled amongst themselves, chiefly, I think, over their rations. We could never trust them out of our sight. One of us would march with them, while the other reconnoitred some miles on ahead. Shahzad Mir, with his pony, was left alone to continue his surveying without interruption. On August 2 a climax was reached, when I upbraided the muleteers for their laziness. We could not induce them to rise and load their mules, and I told them that if they chose they might remain where they were, but that Malcolm and I intended to march. There and then they rose in a body, and seizing whatever they fancied, including the remaining 20 lbs. of flour and the meat, and headed by the caravan-bashi, Ghulan Rassul, marched off in a south direction. This man, who had been with Mr. Littledale on his last journey, had deluded them with the idea that he could guide them to Lhasa. Although we had been warned by the Wazir of Leh against making Ghulan Rassul our headman, still there was no other man at all fitted for the post. We now composed a small party; besides our Duffadar, there remained Lassoo and Esau, twelve animals, and Ruby. Reducing our baggage, we eventually caught the mules and loaded up, and made a long march that same day. But on the second day after this the deserters reappeared; they had had enough of finding their way to Lhasa, and were evidently not on good terms with one another. They begged us to take them on again; but this, with the exception of one man, Shukr Ali, we did not feel it our duty to do, more especially when we learnt from Shukr Ali that there had been a pre-arranged plot, even as far back as Shushal, to leave us when food ran short—furthermore, that they had planned to steal our animals at night-time, and leave us without means of transport and without food. This we had guessed, and had hidden and watched by night, and continued to do so till we knew we had shaken them off. Had we felt we could have relied upon their faithfully serving us, we would have taken them willingly, and were anxious to do so; but we could not trust them, and even now I am convinced that had we done so we should have paid heavily for it.

After this misfortune, we were lucky in finding good grass, fresh water, onions, rhubarb, and game. On August 9 I shot a somewhat remarkable animal at a height of over 16,000 feet. The skin I have here. Two young cubs we carried along with us in hopes of their eventually reaching India. All went well till August 10, when, through the exhausted state of our mules, we were forced to camp at the summit of a pass, 16,614 feet high. There was no grass, but certain hardy plants. On the following morning we were astounded to find nine of the mules were dead. Everything we could possibly do without had now to be abandoned; in fact, we only kept one tiny tent, our bedding, ammunition, and instruments, and the clothes we wore, and we left our two cubs behind with a large supply of meat. We commenced the descent of the pass a sadly reduced party, each with loads on our backs. The weather, which hitherto had been all that could be desired, became very broken, and the going was consequently very heavy; whereas latterly we had been making some 16 miles a day, we now had difficulty in covering half that distance. To add to our troubles, game was very scarce.

Since the day of this misfortune we had been gradually descending, following a small stream which daily increased in volume, and we hoped that this would eventually bring us to people. Our food was kiang and wild onions when we could find any. For ten days we stuck to the stream, crossing and recrossing, when sometimes the three mules would collapse midstream, which flowed fast and cold and about 3 feet deep. At length, on August 22, we found ourselves on the shores of a magnificent fresh-water lake. Everywhere grew rich green grass. On the north side of the lake, along which our path lay, rose grassy hills teeming with wild yak and kiang; above and beyond these were snow-capped ranges. On the south side a vast plain stretched far away to distant mountains. Around the edges of the lake lay perfect skeletons of scores of dead yak. All seemed to choose the shores of this wonderful lake to die by. Flowers, water-fowl, and hares were plentiful. The shore was sandy, with rocks around, reminding one vividly of an inlet sea. It was indeed an artist's and a sportsman's paradise. The lake was about 23 miles long and 4 miles broad in places. At 7 p.m., although nearly 16,000 feet above the sea-level, the temperature registered nearly 50° Fahr.; during the night it only just froze. At the east end of this lake were some sandy hillocks, and a trickling stream took its rise from the adjacent hills. As this stream ran in an easterly direction, we resolved to follow it up in hopes it would bring us to people. Each day the stream increased in volume, so that we dared not cross it. At that time we had even run out of salt, and when we shot a yak, we used to boil down its fat into cakes, and munch it like Everton toffee.

On the 12th day, after we had followed the stream for 120 miles, we providentially fell in with a large caravan of Tibetan merchants. They were travelling at right angles to our route, and were on their way from Lhasa to Tankar, situated on the borders of China. Since leaving Lanak La we had been marching for fourteen weeks, and had traversed very nearly 1000 miles, without seeing a sign of mankind. This caravan had been two and a half months on the road, and expected to reach Barong, in the Tsaidam, in about another month. From them we learnt that the river we had followed was no other than the Chuwa, whose very source we had found. They told us that it flowed through the Golok country, thence on to Tachien-lu, into the Yangtse. This probably flows to Batang, as there is no big river at Tachien-lu. Merchants going by the eastern route would pass through Batang and then Tachien-lu.

A few words about this Tibetan caravan may be of interest. The head of the caravan was a very fine-looking Tibetan from Lhasa, standing over 6 feet high, and always known as the "Kushok." The title "Kushok" was originally applied to living Buddhas, but latterly it has become merely a term of respect or affection, and no longer has any religious significance. Next to him was another important merchant, who shared his tent; then there were several minor ones, who owned perhaps only a few yak; besides these was a lama, or priest, and herdsmen, cooks, and servants, all mounted. There were some 1500 yak and 300 ponies, and altogether they made up an imposing caravan. The fifteen hundred yak were divided into seven distinct companies, moving off in column; and these seven were again divided into two wings. They always marched off in the same order, without the slightest noise or confusion. The yak were always loaded in the dark, and they moved off before sunrise, and although we used to pitch our tent next to the Kushoks, they used to march off without even waking us. By marching after them, we were able to carry out our observations and sketching without arousing suspicion. One day, the Kushok, seeing Shahzad Mir coming in last, carrying the plane-table, asked, "What offence has this man done, that he merits this daily punishment?" He fancied we had adopted some variation of the Chinese infliction of wearing the wooden collar, known as the "canque." No food was eaten in the camp till after the march and after unloading. If there was one thing more than another which aroused our wonder in connection with the caravan, it was the extraordinary knowledge the Kushok had of every little thing that went on. Outwardly he appeared to take scarcely any interest in anything. He rarely came outside his tent, and seemed to spend most of his time in drinking tea and praying.

The Lhasa-Sining route, along which we were now travelling, is no regularly defined road, but every year the caravans renew various old landmarks, and set up new ones on prominent places, generally to denote the camping-grounds. It may sometimes occur that no caravan has done the journey for two or three years, and if the landmarks are not carefully kept up, there might be great difficulty in finding grass and water. For this reason their marches vary in length, from a few miles to 30 a day. One caravan only leaves from each end every year. The annual tribute from Lhasa to the Chinese Emperor does not travel by this road, but by Labrang. They usually start in May, taking about five months on the journey. A caravan from Lhasa to China brings the famous pulo cloth, and great quantities of dried dates (kasur). These come into Lhasa from Calcutta, so that by the time they reach China they are naturally very expensive, almost a penny each in English money.

Caravans from China to Lhasa are mostly employed carrying tea, the main staple of food in Tibet, and some tobacco. The reason why only one caravan goes each year is, that all the merchants are very much afraid of encountering robbers on the road. Very often these large caravans are employed trading for the Talè Lama or other high officials in Lhasa, but whether this is invariably the case, or whether on this occasion, I am unable to say. In matters of business, as well as of geography, the Kushok and his servants were very reticent after the first day or two. At first he used to invite us to tea in his tent, but afterwards we had to pay a rupee for this luxury. The Kushok did impress upon us that the determination to prevent foreigners entering Lhasa was greater than ever. At Tankar, the frontier town of the province of Kansu, there are four Tibetan officials appointed by the Talè Lama to look after the interests of Tibetan merchants, and to arrange any difficulties arising between them and the Chinese.

On September 14 we reached brushwood, the first since Niagzu, and camped on the right bank of the river Shugatza, or Shuga Gol, which at this point flowed through hills in a north-west direction. The river here was some 30 yards across, and from 3 to 6 feet deep, with stony bottom. On both banks was good grazing. South of us lay the Tong hills. Two days later we left the merchants under peculiar circumstances, and next morning found a hot spring bubbling up from the top of a rock standing 4 feet high in the middle of a nullah close to the Shugatza. The water was fairly hot, but tasteless, though the rock was stained a black and yellow colour. It was apparent, from the surroundings, that people frequented the spot. The following day we left the river, which flowed from a more southerly direction, while we steered for some white rocky hills at the entrance of a nullah. All the way up the nullah were skeletons of dead yak, showing what hardships some previous caravan had undergone. We also picked up a keg of opium.

After crossing the first range of hills, we came to a small hill at the entrance to another nullah; on the summit was a large pile of stones decorated with sticks and red rags. This was evidently a camping-ground. The spot is called Dapsoga, and the little hill Ser. Close to here the Namoran Gol takes its rise, and it is the junction of the two roads into the Tsaidam, one leading over the Namoran Dawan, and the other more west, the Burhan Bota. The latter, though a little longer, is the one generally chosen, for it is more suited to laden yak, which are liable to get lost and scattered in the thick bush over the former.

On September 21, camp 122, on the banks of the Namoran Gol, we found brushwood 8 feet high, and afterwards wild currants and other berries, which Ruby ate voraciously. We also came to a stone building, 12 feet square, wherein was a huge prayer-wheel, for ever being turned by the force of water. Hanging about on the bushes were numbers of prayers on linen, the largest one of which I seized and have here. Close by Malcolm shot a bear (*Ursus pruinosus*). After crossing these ranges, we entered a desert plain, till eventually, in a desperately hungry condition, we fell in with Mongols, the Tsokpo or Sokpor Mongols, who were living with their flocks in the bush. At this place the Namoran Gol splits up into several small streams, and there is good grazing and thick bush. We journeyed two days east with these Mongols, to their tents on the banks of the Bayan Gol. On the way we crossed a salt district, and the river Shishi. We were now in the district of Dsun, some 10 miles north of Barong. Just south of Barong is another pass called Hato, which runs into the Lhasa road; but it is hardly used, and not a recognized road, like the two others mentioned. The climate on the Bayan Gol is, I am told, most genial all the year round, for it seldom rains or snows, though they can see it raining in the mountains around. These Mongols were most unsophisticated, and persisted in taking pinches of Cadbury's cocoa, which they maintained was snuff.

We lived with these people for three days on the river, meeting with great kindness and hospitality. We were endeavouring to persuade them to help us with ponies into Tankar, a distance of 300 miles. They told us we could get camels at Barong, but with so small a party the owners would not dare to go. They would have to pass through a district inhabited by the Bana tribes, shown in the map Banakhasum—*sum* meaning "three;" that is to say, there are three of these Bana tribes, and these again are subdivided into eighteen small tribes, each with a separate chief, the whole being under the Sining Amban, or Tsong T'u. It is through fear of these tribes that the Tsokpo Mongols so seldom make the journey to China. At length we persuaded some of them to help us, and on October 1, we left the banks of the Bayan Gol, accompanied by Lobsan, an influential Mongol, and whose real name is Dsun Choni Lama, and three other men and ten ponies. As we drew near the black tents of the Bana tribes, Lobsan and his men thought it as well to rehearse a battle by night, so that all might be prepared. Soon after sunset, big fires were made to represent a big camp, when they pretended that imaginary enemies had fallen upon us. They fired off their matchlocks, and rushed here and there, crying out, "Ho! hi! ha!" Malcolm and I sat by a large fire of argols, warming our toes as we watched the terrible battle they were engaged in.

On the third day we hit off the main track running from Barong to Tankar, and, after crossing an easy pass, where was a stream whose water was considered poisonous, for it was never drunk by man or beast, we dropped down into the valley of Noring Gol. Here lay a salt lake, where we saw the first signs of the late Mohammedan rebellion, for there were two deserted and ruined Mongol villages, devastated by the rebels in their flight from China into Turkistan. The crests of the hills in this neighbourhood were clad with pine trees. On the sixth day of our march we hit off the Tuling Gol river, and the next day saw signs of a large encampment, where the Chinese had halted in their pursuit of the rebels. A short distance further on was the village of Selling Gompa, where I was told the French traveller, Dutreuil de Rhins, had met his untimely end.

At this spot are two roads to China: the right-hand one runs through a salt district, and, though shorter, is a rougher road, and more dangerous on account of the tribes. We chose the left-hand one, and after 10 miles came to a wonderful rock called Kanjur Rungyum, which means "Sacred writings, not built by men." On one side of the rock was a courtyard, built of big blocks of white stone, some of which were 2 feet long. On many of the stones were Chinese and a few Tibetan inscriptions. Hanging across one wall was a string with hairs from horses' tails, and bones with inscriptions on them attached to it. On entering the courtyard, we found a cave, some 30 feet high, inside the rock, and there is the entrance here of a subterranean passage, which is said to run all the way to the salt lake of Koko Nor.

Soon afterwards we crossed an easy pass, the Nicotine Kotal, to a spot called Utu by Tsokpo men, and Bara nullah by Lhasa men. There was good grass, but the mountains, except where pine-clad, were barren and rocky. Later on we crossed the river Buka,* which ran into the Koko-nor. We found the bed of the river a quarter of a mile across, the water being split up into channels some 15 yards broad. The water was 2 to 3 feet deep, and flowed over a stony bottom. This river we followed till we reached the cairn of Hatuturgy, on the west of Koko Nor. Here, on October 10, we experienced the coldest night of our journey, which we spent in the open without shelter. There were 27° of frost.

We travelled along the north edge of Koko Nor, where we overtook immense numbers of yak, laden with wool and salt, on their way to China. There was fine grass land throughout, and great numbers of black tents of the Bana tribes. While marching along the shore, we had just been able to make out the island away towards the south side, but no two men gave the same account about the inhabitants, and travellers have varied in their accounts about it. Later on, we were able to get a reliable statement about this "Dragon Colt's island," as it is called. There are twelve or thirteen priests living there, who keep sheep and goats, and, being free from depredations of wolves, the flocks thrive well. In winter, when the lake is frozen over, they cross to the mainland and lay in stores for the summer. After crossing a pass, we followed a stream, the Hsi Ho (West river), or Ta Ho (Big river), or Chuchok by Mongols, which brought us to the frontier town of Tankar, or Donkyr as it is shown in some maps.

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* Buhain Gol (?).

The town was crowded with Chinese, and a sprinkling of Mongols and Tibetans. We received every civility from the officials of the place, more especially from the colonel commanding the troops. But as all had been disbanded, it seemed strange that he should still be in command. Tankar lies in a kind of hollow, commanded from all quarters by hills and rising ground. The chief hills are Ho-la, or Ta Sand, lying north-west; and Toai Ta, or Wupu, lying south-east. From the summit of this hill, the town of Sining, 30 miles off, can be seen; and a tree is planted on the summit, as a landmark to travellers. The chief importance in Tankar consists in its being the most westerly town of the province of Kansu, and commanding the roads to Koko Nor and Lhasa. The merchandise imported there is carried further on to Lanchau and Peking, etc. At Tankar itself very little buying and selling goes on. The wool, for instance, is forwarded by a Chinese agent to Peking by camels or by raft.

Thence, under the guidance of Mr. Rijnhart, a missionary, who was living at Tankar with his wife, we rode on to the monastery at Kumbum. He had spent two years at Lusar, and ten months in the monastery itself, and had made friends with a very large number of its inmates, more especially Mina-Fuyeh, one of the greatest incarnate saints in the place, and in whose house we were to spend the night. For the first 15 li our road lay along the left bank of the Si Ho, till we crossed it by a cantilever bridge, close to the village of Hsang Ho Ri (Sounding river), where is a small inn. We then crossed the pass Wu-la, from the summit of which we were able to note the results of the recent Mohammedan rebellion. Every village that was not in ruins had loopholed walls and fighting-towers, which had been specially erected. Rich and fertile though this little bit of Kansu is, with its crops of wheat, barley, oats, millet, peas, linseed, and opium, it will be two years before it can recover from the trying times it had passed through. The moon was high in the heavens when we reached our destination. Our continual knocking at the great wooden gates of the monastery sounded loud in the still frosty night air, but at length they were opened by one of the Greek manservants, who, on seeing Mr. Rijnhart, was all civility. While word was being sent to Mina-Fuyeh, we busied ourselves with our horses, and soon afterwards mounted the stone stairs, and, after crossing an open court, were ushered into the presence of one of the highest men in the eastern border of Tibet. On arrival at the monastery, we received every kindness from the saint Mina-Fuyeh, a man of twenty-seven years of age, and is now in his sixteenth or twenty-second lifetime. He is a man considerably below medium height and of slight build; he has a very pleasant face, especially when lit up by a happy smile, as it often is. His explanation of how he came to be recognized as the reincarnation of the previous Mina-Fuyeh, shows how convincing the proofs of identity are to one who has been brought up to accept and believe in the theory. He relates how, when very small, various articles had been laid before him, from which to select those he had used in his previous lifetime. Amongst these was a number of "rosaries," from which he had no difficulty in choosing his own. "For," he says, "I had used it daily for years. How is it possible that I should not know it amongst all these others?" So on with other articles; his identity was established without a doubt, and he became the heir to the accumulated property of fifteen former lifetimes. He talks freely of his last lifetime, pointing out the site of the house in which he lived, and which was burnt down about two years before his death. "It was," he says, "a far finer house than the one I now occupy." In Kumbum there are about seventy of these "incarnate saints," and Mina-Fuyeh ranks sixth or seventh. He was a liberal-minded man, and told us about the monastery, and told us to go wherever we chose, and take pictures of whatever we wanted.

Kumbum itself lies at the junction of two small valleys, one coming from the east, the other from the south, the buildings lying to the south of the former, while on the north is the "Precious Hill," which keeps off all evil influences. On the east side of the other valley are most of the private dwellings, while on the west are temples. Altogether, in Kumbum there are close on 4000 priests, about 70 per cent. of which are Tibetans, 20 per cent. Mongols, and the remainder Chinese. It has, I believe, been stated that Kumbum is entirely Chinese in its government and organization. That this is not the case needs no further proof than the fact that in all things temporal it is under the Tsong T'u or Prince of Koko-nor, a mandarin appointed by the emperor to govern all his Tibetan dependencies in this direction. He lives at Sining, and is known among Tibetans and Mongols as the "Seling Amban;" on the other hand, if Kumbum were really Chinese, it would be subservient to the Fu of Sining, and would be governed by the Fu T'ai. There is, moreover, a distinct boundary-line, separating the territory which comes under Fu T'ai from that which comes under the Tsong T'u; those living within the boundary paying taxes to the monastery, while those outside pay to Sining Fu.

All the private houses at Kumbum are supposed to be whitewashed annually, but, like many other things, had been neglected owing to the rebellion. The method of whitewashing appears strange to us, for the custom is to mix the wash, then to ascend the roof and pour it down over the walls. The result is not quite satisfactory, but customs like this cannot be altered. We visited each temple and hall in succession. Perhaps the chief feature of the place is the "Gold-tiled Temple," the pride of Eastern Tibet, the sacred shrine of Tsong K'aba. At the entrance to the shrine were a few lamas *kotowing*, and the boards in front of the doorway have been worn away to the depth of 3 or 4 inches. Most of these lamas knew Mr. Rijnhart, and stopped in their devotions to speak a word of welcome to him; and one of the doorkeepers asked why we did not knock our heads before entering. To this Rijnhart replied that it would be no sign of respect on our part, as our custom was to remove our hats on entering a sacred place; nor did we ever omit to do so. The figure of Tsong K'aba is considerably above one, in a sitting position, and not easily seen in the dim religious light. It is about 8 feet high, I should say, and very richly gilt. Below and in front of him is the shrine, with the usual holy-water vases and butter lamps, with handsome gold and silver lamps on either side, and a fine pair of elephant-tusks. Next in interest to the golden image, among the relics in the temple, comes the stone on which Tsong K'aba's mother sat when delivered of her saintly son. We then ascended to the second floor, where we were on a level with the image. There was yet another story, from which we looked down on to the lower portions of the gilded roof. The priests say there is a quarter of an inch of gold over the roof, but, even deducting a great deal, it must be of immense value, and one could not help wondering how it had escaped the two rebellions in the last thirty years. One would have thought they would have risked anything to secure such loot, and to deal such a blow to the rival religion as the sacking of this temple would be.

On the right of the gold-tiled temple were two small temples of Sakya Muni. There is nothing in them peculiar, merely the ordinary ornaments and lamps; but just in one corner is the original "Sacred Tree," which sprung, according to some, from Tsong K'aba's hair, according to others, from his swaddling clothes. However this may be, the fact remains, that on its leaves a true believer can distinctly trace the figure of Sakya Muni, or his name in Tibetan characters. Some priests say that one thing is to be seen, and some another, but Mina Fuyeh says that on some leaves the figure may be seen, on others the characters. As only firm believers can trace anything, the question is likely to remain in doubt, in spite of Abbé Huc's assertion that he detected images. Mr. W. W. Rockhill states that he was informed by Mr. W. B. Hemsley that this tree is the white sandalwood.

From the public reading-hall we went into that for private reading —a fine room with rows of low forms about 6 inches high, comfortably cushioned, and big enough to hold 2500 priests. In front of this is another courtyard, in which, we were told, it is no unusual sight to see 1200 or 1500 pairs of shoes, belonging to students inside. How any one can find his own again on coming out is a mystery.

From Lusar the road lies over an easy pass into the southern valley, which it follows right up to the western gate of the town. All the way to Sining signs of the rebellion were plentiful, just as they had been on the way from Tankar. The whole countryside had been devastated by the Mohammedans while they had had the upper hand; but at the city gate the tables were turned, for hanging in cages on the wall were the heads of the ringleaders. At the mission-house we were most hospitably received by Mr. and Mrs. Ridley, of the China Inland Mission. He kindly gave me all his notes about the rebellion, to make whatever use of I wanted. They were shut up in Sining, the very heart of the rebellion, for some months, and did much good attending to the wounded.

Although this outbreak of religious enthusiasm was of no small importance, it was drowned by the Japanese war, on which the whole attention of Europe was centred. It struck me as almost incredible that the Chinese Government, although well aware that the "Salar" Mohammedans were a most restless and fanatical sect, and also that, although the previous rebellion had only ended some twenty years ago, still at the present outbreak there were no adequate means at hand to cope with the insurgents. Consequently, the rebellion grew so rapidly that before soldiers could arrive from the seat of the Japanese war, close on 40,000 Chinese in Sining and the district had been slain, and nothing but the really splendid behaviour of the chief military official, General Teng, unsupported by trained troops, prevented the town falling into the hands of the rebels. By the time Sining was relieved the trouble had grown to such an extent that the Russians in Turkistan had begun to move troops, in anticipation of the Mohammedans following the example of their co-religionists in the East.

At Sining we hired mules and started for Lanchau, where we looked out for landmarks mentioned by previous travellers. In the first day's march there were two such landmarks, or, more correctly speaking, there should have been two; the first, 30 li from Sining, a bridge over the Hsi Ho, mentioned by Mr. Littledale; the second, another 30 li on, was the "Peh Ma Sei," or White Horse temple, mentioned by Mr. Rockhill. Unfortunately, these are now things of the past; the bridge was swept away by a flood soon after Mr. Littledale saw it, and the White Horse temple was utterly wrecked by the fanatical Mohammedans.

At Lanchau, famous for its tobacco, grown and manufactured there, kind missionaries again helped us in getting carts to take us on to Chungwei, a week's journey. This was the first town where we experienced incivility, and became well aware of the hatred of Chinese to foreigners. In these districts we found coal-mines, pewter, iron, saltpetre, and soda; the latter is dug out and burnt all day and night in big fires of weeds to cleanse it. We also learnt, for the first time, that Mr. Littledale's remarks before the Royal Geographical Society, about sending unprotected Swedish girls to live in out-of-the-way parts of China, had given serious offence. We were assured that unmarried girls were never sent out to stations alone, but were invariably sent to live with a married couple, and every precaution taken to guard them from any danger. At the same time, there is no doubt that Mr. Littledale's intention has been misunderstood, and could this misunderstanding be cleared up, I think it would be all for the better.

From Chungwei we took a flat-bottomed wool-boat to PaoT'eo (Bautu), and thence carts to Peking, where we underwent perhaps the strangest sensation of the whole journey, when, with the grime of our eight months' travel, we suddenly found ourselves in Lady Macdonald's drawing-room. At Peking, which had taken us so long to reach, we could only dwell for three days, for the Gulf of Pechili might be frozen over at any moment. At Tientsin, on arrival at the Globe hotel, we were looked upon with the gravest suspicion, and only with the greatest difficulty did we manage to secure one small room between us. A little later, when our landlord found out who we were, he was profuse in his apologies, and anxious to put us in better quarters, explaining that he at first had taken us for robbers. This was rather hard, after having had baths regularly for the last four days, having shaved our beards, and having borrowed clothes from Mr. Hugh Grosvenor at Peking, but it made us realize what a shock we must have given Lady Macdonald on our first appearance in her drawing-room.

Without the help of my friend Malcolm, I am quite sure this journey would never have been accomplished; nor can we ever forget the valuable help afforded by Shahzad Mir, nor the ready and willing spirit with which our two servants Esau and Lassoo served us throughout. The former returned to his regiment, and the two latter to their homes in Ladakh.

Sometimes, on cold nights, when reduced to a small party, Malcolm and I used to sit with our men round the fire, and tell them of the pleasures and advantages of civilization. Esau and Lassoo had never seen a boat, and pictured to themselves a life of eating, drinking, and smoking, without work. But on realizing they learnt that civilization was not without its drawbacks, for the first day at sea the cigars we had given them lay scattered about, and they lay prone and sick, and longed to be back in the middle of Tibet by the most dreary salt lake. Like other travellers, we found it our hardest task to part with Shahzad Mir and these two men.

Before the reading of the paper, the CHAIRMAN (Lord BELHAVEN AND STENTON) said: I am sure you will be as sorry as I am that our distinguished President, Sir

Clements Markham, is unable to be present here on account of illness. I hope that it is an illness which will not last long, and I am glad to say that he is already improving. I also wish to mention that we have the pleasure of having present with us this evening Dr. Thoroddsen, who has done so much for the geography of Iceland, and who, for seventeen years, has every summer worked at the survey of the inland portion of that island, which has hitherto been unknown, and it is a great pleasure to the Society that he should be here on this occasion. I will now call upon Captain M. S. Wellby, of the 18th Hussars, to read the paper which he has kindly prepared for us on the subject of his long and interesting journey through Tibet, from west to east. I am sure that the subject is one which will interest the Society very much, the more so as the greater part of the country which he will describe has hitherto been untrodden by any European.

After the reading of the paper, the following discussion took place:—

Mr. St. G. Littledale: Listening to the account that Captain Wellby has just given us of his adventurous journey, has brought back to me very vividly our own struggles when crossing through very similar country, and I am very much impressed with his getting through at all, considering the smallness of the caravan with which he started. Where he took a hundredweight of food for his horses, we took tons, and we were in the sorriest straits, and I think it is a matter of the highest credit to him that he was able to get through at all. Comparing his route with mine, I have little doubt that the horse's leg with the shoe on which he found, was at one time my property. Had he only gone a few marches further south he would have found, I am sorry to say, very many more relics, and had he only had the luck he might have stumbled across the record yak I happened to kill one day, but had to abandon. I was prouder of that head than anything I got that trip; but unfortunately it is left for another Captain Wellby to pick up. Captain Wellby's paper was the first intimation I have ever received that the Swedish ladies had resented my remarks about them, or that they thought that what I said was casting a slight on their religion. I am very sorry that they so misunderstood my motive, which was simply to point out that I thought it was very reprehensible that these girls should have been sent out to the interior of a country like China without any married people, who knew the language and customs of the country, to look after them. So far from casting a slur on their religion, I am quite certain that the only way to get at these Chinese is by living amongst them, and that is exactly what these devoted ladies were doing. I think that what I said was not a bit too strong for the occasion, and the sentiments that I expressed were more strongly expressed by the diplomatic people in Pekin, and by the consuls on the coast; but I understand that now these Swedish girls are, a great many of them, married, and of course their husbands are in a position to look after them.

Sir Richard Strachey: I think, my lord, that the first impression that was left upon my mind by hearing Captain Wellby's account of his remarkable journey was, how easy it was to give an interesting account of so tremendous an undertaking as that which he has gone through. I speak with some knowledge of what his journey really means. It is now just fifty years ago since I made my comparatively smaller journey in Western Tibet, and the experience that I had then, satisfies me of the extreme hardships and difficulty that a journey of that sort must involve. The climate in itself is quite sufficient to try the strongest constitution of the most resolute man. The account that Captain Wellby has given of the destruction that fell upon the whole of the animals that he took with him, and brought him to what was nothing less than great peril of his life, is one of those things you may talk about, but unless you have gone through it you cannot appreciate. When I first became acquainted with Tibet—as I say, just fifty years ago—

although I was not actually the first of English travellers in that remarkable country, I was amongst the first. At that time literally nothing was properly known, not only of Tibet, but of that great range of country which may be called Central Asia, which extends across the great plateau which lies between the northern boundary of Tibet and the southern mountains of Siberia. The only sort of knowledge one then had of the country was to be found in Humboldt's remarkable researches collected in his famous book 'Asie Centrale,' but it was founded, to a great extent, upon the reports of native travellers, and it was extremely imperfect. Now, during these fifty years, the whole of that great region—I don't say in detail, but the main features of it—has been made entirely known to us. Tibet itself, that most inhospitable of countries, has been traversed, more or less thoroughly, in all directions, and, geographically, this journey of Captain Wellby is very important and very satisfactory, because it gives us now a definite and absolute knowledge of the features of the country all along the 35th parallel of latitude, and we are able to say that they are virtually uniform throughout. The lowest part of the country through which the journey was made would be possibly 15,000 feet above the level of the sea, and the mountains rise to 19,000 or 22,000, and probably in some places even higher. It is a country which, although at so great a height, is during a great part of the year practically snowless. No doubt in the winter snow is there, but the fact seems to be that in the summer months it is almost as difficult to find snow on the surface generally as it would be in the hottest of the plains of India. The extreme power of the rays of the sun, of which Captain Wellby has spoken, which makes the climate so extremely trying, is due to the great rarefaction of the air and the great clearness of the sky. In the summer months, the great heat during the day, combined with the great cold at night—the cold arising practically from the same causes that give such great intensity to the power of the sun—make a climate which is thoroughly detestable. All I can say of Tibet is: Let no one go into the country who has not some specific object in view, either, as it may be, to get a wild camel or a wild yak, or for the purpose of geographical exploration. The feeling I had on my return was, that I was very glad I had been there, but I never wished to go again.

The CHAIRMAN: It is my pleasing duty to congratulate Captain Wellby on his very successful though arduous journey, and to thank him on behalf of the Geographical Society for the interesting and valuable information he has brought to us from this desert and difficult land, and to ask you to give him a vote of thanks for the extremely interesting lecture he has given us, and for showing us those excellent slides which have illustrated his lecture so well.

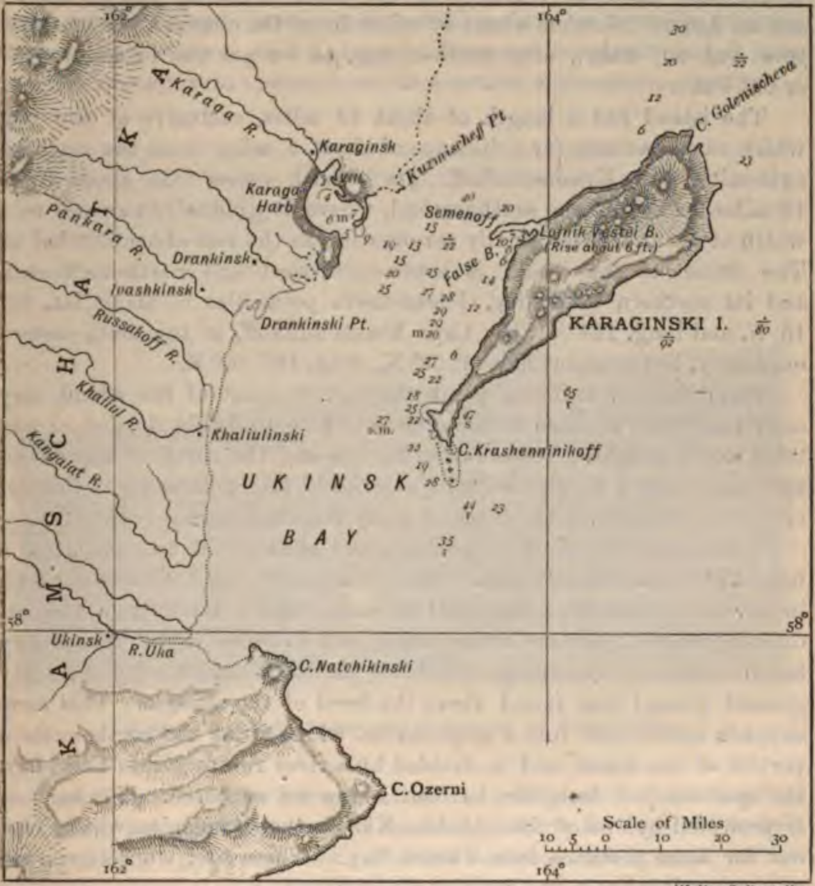
A VISIT TO KARAGINSKI ISLAND, KAMCHATKA.

By G. E. H. BARRETT-HAMILTON and H. O. JONES.

FEW parts of the North Pacific coast-line are less known to geographers or navigators than the north-eastern seaboard of Kamchatka, much of which is still indicated on our Admiralty charts merely by a dotted line. It is therefore hoped that the following notes and photographs, taken on a visit recently made to the island of Karaginski and the neighbouring mainland at Karaga, may be of interest, the latter especially, since they give some insight into the life and customs of the people of Upper Kamchatka.

The visit, having been made in performance of the duties of one of the writers while employed in connection with the Bering Sea Mission, was necessarily a very short one, and even the present meagre notes could never have been collected had it not been for the willing help afforded by the captain and officers of H.M.S. *Linnet*.

The island of Karaginski is, from its position, less likely to be visited by scientific explorers than either the more southern or the more northern parts of Kamchatka, since expeditions returning from the north are usually in too great a hurry on their homeward journey to be able to stop at an intermediate locality, while it lies far to the north of the track of ordinary visitors to Kamchatka. Hence it is that, as far as we can ascertain, the island has never been touched at by any scientific expedition.



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COAST OF KAMCHATKA AND KARAGINSKI ISLAND.

Karaginski island lies off the eastern coast of Northern Kamchatka, from which it is separated by Ukinsk bay—a channel varying from about 30 to 50 miles in breadth. The temperature of the surface water in this channel on August 20, 1897, varied from 50° Fahr. in Ukinsk bay to 51° Fahr. in Karaga harbour, which was a degree or two colder than the sea outside the bay, the coldest water we noted (49° Fahr.) being at the entrance to Ukinsk bay at midnight on August 20. At noon on August 22 the water in the bay was 55° Fahr.; and on August 24, when about 40 miles down the channel, the temperature was 50° Fahr., afterwards rising, as we got out to sea, to 57° or 58° Fahr.

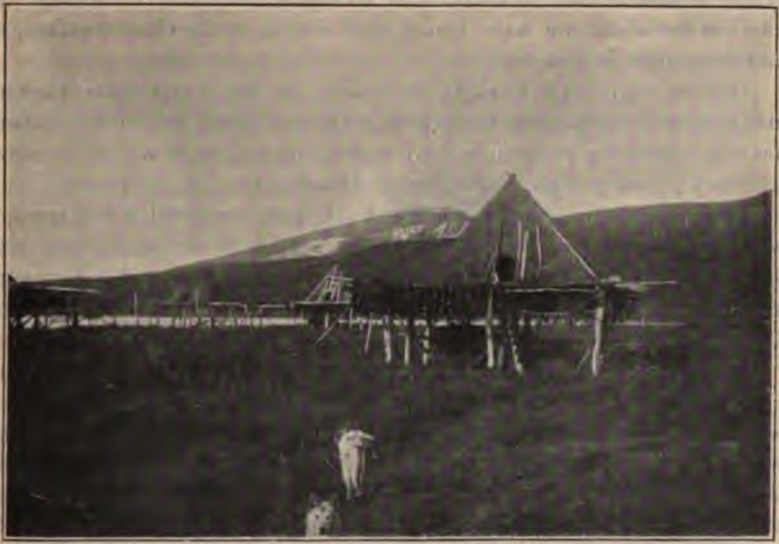
The island has a length of about 67 miles, exclusive of the reef which runs seawards for a distance of about 6 miles from the southern extremity, Cape Krasheninikoff. Its breadth varies from about 15 to 18 miles, except at the southern end, where it gradually narrows to a width of about 2 miles, finally terminating in the reef above alluded to. The trend of the island is south-south-west and north-north-east, and its northern extremity, Golenischeva point, lies in about lat. 59° 15′ N. and long. 164° 41′ E.; Cape Krasheninikoff, at the south-eastern extremity, lies in about lat. 58° 22′ N., long. 163° 30′ E.

From the low southern point the eastern coast of the island very soon rises into a range of mountains, which probably do not exceed 2000 feet in height. Towards Bering sea and the north of the island the range seems to terminate in a series of fine precipices, at the feet of which, probably, is the home of many seals and perhaps of walrus.

Westwards the slope is gradual, and ends in an escarpment of a height of from 20 to 30 feet. This escarpment has been cut through in several places by some small streams, which issue from the undulating central portion of the island, and between it and the shingly beach there is, at the village which we visited, a narrow strip of thickly grassed ground just raised above the level of the shingle. This strip expands northwards into a large marsh, which forms the north-western portion of the island, and is drained by a river running into False bay, the spacious but deceptive harbour where we anchored. The harbour is protected by one of the peculiar Kamchatkan sandspits, which runs out for some distance into Ukinsk bay. There are, we believe, one or two small lakes in the interior of the island.

In the evening of August 20, 1897, H.M.S. *Linnet* approached Cape Ozerni, on the mainland of Kamchatka—a point which forms the southern termination of the entrance to Ukinsk bay, here having a breadth from Ozerni to Krasheninikoff capes of about 40 miles. No dangers are marked on the chart in connection with the former headland, and we were considerably and disagreeably surprised to find running out from the cape, for a distance of about 1½ miles in a north-easterly direction, a reef, on which a heavy swell was breaking so violently that huge sheets of water and spray were being hurled into the air sometimes to a height of about 30 or 40 feet. The whole coast of this part of Kamchatka is, however, so little known, that it would be hard indeed to find a part of the world the charts of which are less reliable.

It was our intention to run up Ukinsk bay and anchor in Karaga harbour on the mainland just opposite to Karaginski island, before visiting the island itself. Little as Karaga harbour itself is known, the coast both north and south of it is even less so, not having been charted at all north of Cape Kuzmischeff, as well as for a considerable distance between Cape Ozerni and Karaga harbour on the south, and it was therefore necessary to approach our destination with extreme caution.



PART OF KARAGA VILLAGE, WITH BALAGAN IN FOREGROUND.

From Cape Ozerni to Karaga harbour is a distance of about 80 miles, and during the night we stood off the land, waiting for daylight to help us in our run up Ukinsk bay. On the morning of August 21 we ran up the channel, very soon getting into calm and shallow water, the soundings, which had showed bottom at 90 fathoms at the entrance, gradually decreasing to 10 fathoms as we neared the harbour.

The 21st was a brilliant, clear, and warm day, and as soon as the morning mist cleared off the land, we had an excellent view of our surroundings. Almost to the southward lay the entrance to the bay through which we had passed, the land here being high, and showing some very finely peaked mountains. Further north on the mainland, the chain of magnificent mountains which forms the backbone of Kamchatka retires to a distance of from about 30 to 40 miles from the coast, leaving between it and the sea a stretch of undulating bush-covered tundra land, gradually ascending to their base. These mountains are, for Kamchatka, apparently of no great height, and the highest summits do not perhaps exceed 4000 feet. Yet they were boldly peaked and outlined in a manner exactly like the higher mountains in the southern part of the peninsula, to which they were only inferior in their lesser height. There was little snow remaining on them, and, if one may judge of this from the much greater quantity which we saw on the western slopes of the far smaller Karaginski mountains, the western side of the range must be that on which most snow lies.

From these mountains several rivers run down into Ukinsk bay, and at the mouth of one of these—the Karaga river—are the village and harbour for which we were bound, and which, in the clear weather, we had no trouble in making.

On our right lay Karaginski island, its far lesser hills showing many more snow-patches than those of the mainland, and in the distance bearing a striking resemblance to Bering island, from which, however, it differs in being a good deal less mountainous.

Birds were numerous in the channel, and we noted a few terns, as well as gulls of more than one species. Red-necked phalaropes were very plentiful, as they are elsewhere in Kamchatka, and a fine adult albatross (*Diomedea albatrus*) rose from the water at our approach. Duck of several species were also in abundance.

We anchored in Karaga harbour at noon, and could make out with our glasses some balagans, and traces of a village of some sort on shore. It was not long before a boat left the ship to reconnoitre, and on the beach was met by several of the natives. These turned out to be very friendly, and, what was equally important, could speak Russian, so that we were able to communicate with them. Later in the evening, several parties left the ship in search of sport, natural history specimens, and objects for the camera.

Karaga harbour is of fair size, but with little depth of water, and the bar at its mouth, on which the water shoals * to from 5 to 3 fathoms, must always effectually prevent the approach of large vessels. H.M.S. *Linnet* was probably the first man-of-war of any nationality, and certainly the first English man-of-war, to enter it. Like several † of the other Kamchatkan harbours, it is sheltered by a long pointed sandspit, which runs out for some little distance into Ukinsk bay. Right inside of this, and close to the shore, a second sandspit runs out in a nearly opposite direction, cutting off, except at one point, a considerable part of the inner extent of the harbour; on this second spit a choppy sea sometimes breaks with some force.

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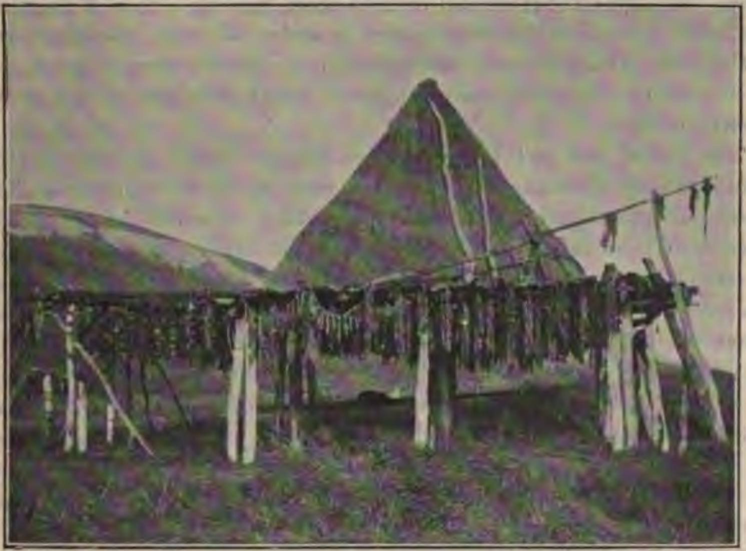
* We are indebted to Lieut. H. A. Gillett, of H.M.S. *Linnet*, for the information that the bar has a depth at low water of 3 fathoms at the south, and at the north of 4 fathoms. At its centre it is supposed to deepen to 5 fathoms.

† As, for instance, at Petropavlowsk, and also at Berevinskaya bay, near Cape Shipunski; in the latter case, on the authority of F. H. H. Guillemard (see 'Cruise of the *Marchesa*,' p. 216, 1st edit.).

The harbour is well protected, but from the south-east a sea dangerous to boats might set up with a south-easterly gale. There is good holding ground on mud or sand, with an average depth of 7 to 9 fathoms after passing the bar. The *Linnet* anchored in 4 fathoms close to the sand-spit, 1½ miles south-east of the village.

The little village of Karaga consists of seventeen straggling balagans,* six yurts,† or mud huts, and one small tent, plainly labelled with the name and address of a firm of San Francisco merchants, the tent having been apparently constructed of flour-bags sewn together. The total number of inhabitants can hardly exceed thirty, even supposing that each yurt may be regarded as the residence of a separate family of five individuals, such as is shown in our photograph, p. 287. The yurts, therefore, have the proportion of one to about three balagans, and not, as described by James King in the case of the Kamchadales of Petropavlowsk, of one to about six. This authority, the author of 'Cook's Third Voyage' (1784), states that, at Petropavlowsk, when he visited that town in 1779, there were nineteen balagans, three yurts, and



A BALAGAN AT KARAGA VILLAGE.

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* A balagan is a wooden hut raised on piles to a height of about 10 feet from the ground.

† A yurt is a wooden hut covered over with sods and grass.

seven log-houses, the latter being an introduction made by the Russians. According to King, each family possessed a balagan for use as a summer habitation, but the yurts were used in winter by as many as six families in common. Our experience was slightly different, since we found both yurts and balagans in use at the time of our visit. This is also contrary to the present custom at Petropavlowsk, where the balagans are now only used as storehouses, and while the richer people of that town live in log-houses, the poorer have to be content with yurts.

The *yurts* and *balagans* at Karaga seemed to have been very carefully built. The door and doorway of the former were of wood, and the interior carefully constructed of roughly hewn logs, over which a thick wall of sods had been laid. There were generally two compartments, one a small sort of hall or ante-room, having a floor of hardened mud, and through which one passed in order to reach the inner part of the *yurt*, which formed the second and largest compartment. In the centre of the outer compartment a rough fireplace of stones was sometimes built.

The roof of one *yurt* into which we entered was supported by four posts, forming a rectangular space between them in its centre. This was the main compartment, and was separated by a wall of wood, with a door in it from the hall.* Those parts of the main compartment which lay outside the rectangular space between the four pillars were raised to a height of a few inches from the ground, and the whole floor was strewn with clean grass or rushes, which might serve as a carpet by day and as bedding by night, and gave us an idea of being far cleaner than the *yurts* of Bering or Copper islands, notwithstanding that the latter contain evidences of modern civilization in the shape of beds, crockery, and iron stoves. Nevertheless, the odour of the Karaga natives, and the readiness with which they spat on the floor, warned us that their supposed cleanliness was probably more apparent than real.

In the Karaga yurt the people sat or lay upon or near the edge of the raised portion of the inner compartment, exactly as portrayed in the plate in 'Cook's Third Voyage.' On our entering, however, a rough table was placed before us, with a bowl of the yellow "morushka" berries and a spoon. In another corner of the yurt a fire was burning, and the smoke, which penetrated to every part of the edifice before escaping through a hole in the roof, soon drove us into the open air again.

These yurts are so solidly built that it is perfectly safe to stand on the top of them; in fact, the roof is commonly used as a receptacle for things which the natives do not wish to leave on the ground. It is also a favourite resting-place for the dogs.

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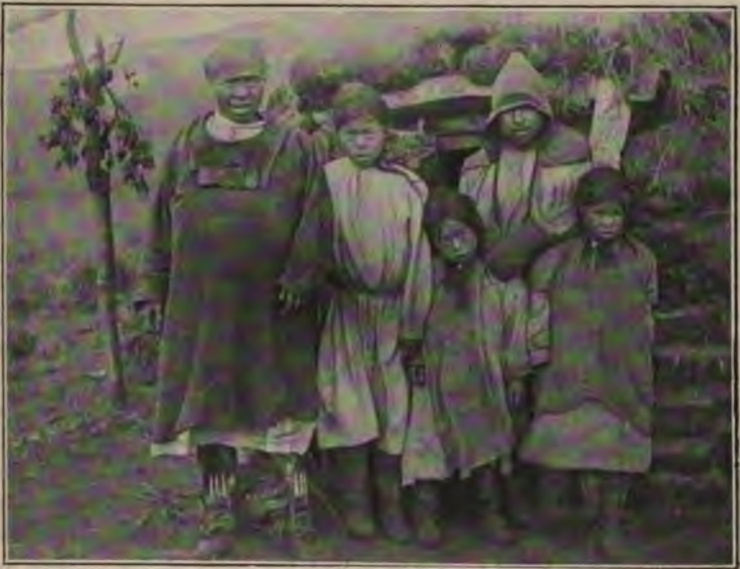
* As a rule, the only division between the two compartments was a wooden partition about 3 inches high, the whole flooring of the inner room being raised to that height.

Quite a different sort of edifice is the *balagan*, a thatched pyramidal hut raised to a height of 10 or 12 feet from the ground on posts and entered by a rough ladder * formed of a tree-trunk placed loosely leaning against one side of the floor, and having big notches roughly hewn in it to form steps. In the centre of one side of the room thus formed was a rough and doorless entrance, covered with a skin; and below the flooring hung the dried salmon which form the winter supplies of the natives—thus safely placed out of reach of the hungry sledge-dogs.

On the whole the balagans seemed to agree very closely with those described and figured by King and other earlier travellers. In the pictures given by Steller, however, the balagans have a rounded, not angular, exterior, and the ladders are not of the primitive type, but quite modern in appearance. The balagans also as seen by us differed from those described by King, in being provided with only one and not with two entrances. The shape of the balagans at Karaga is also worth noting, they being pyramidal, whereas those of Petropavlowsk as well



A FAMILY PARTY AT KARAGA VILLAGE.

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* Such ladders were found on the Kamchatka river, on the mainland, by Guillemard (see figure on p. 80 of Edition II. of the 'Cruise of the *Marchesa*'), as well as in such a widely different locality as Andai, in the north of New Guinea (*op. cit.*, figure on p. 391). In the latter case they cannot have been intended to prevent the access of animals, since the native dogs are stated to be able to ascend by them. I believe I also saw the same ladders leading to *balagans* on the island of Hoven Saki, in the Southern Japanese archipelago, but could not be quite sure through my glasses.

as the raised storehouses of the Ainus of Yezo,[*] are gabled like an ordinary hut raised on poles. But in the latter case the influx of Russian civilization would seem to have degraded the balagan from summer dwelling to winter storehouse.

The Karaga yurts differed from those described in the old voyages in being entered from the side only by means of an ordinary doorway, and not from the top by means of a ladder.[†] In this respect they bear a very great resemblance to photographs which we possess of the yurts at present in use among the inhabitants of Unalashka, the Commander, and the Kuril islands. The latter seem to have replaced, and to be a modern improvement of the yurt with the entrance in the roof, as in Cook's Voyage there is an excellent figure of one of the latter kind at Unalashka.

Our photographs will show the dress and appearance of the natives better than would a long description. They were for the most part clad, like other northern races, in robes of reindeer-skin, the furred part being worn inside, and with a square piece turned downwards in front of the neck, and sometimes ornamented with patterns made from different kinds of skins, the whole reaching not lower than the knees. Most of these robes were provided with hoods, but several of the natives wore old peaked Russian caps, which they had no doubt obtained from the crew of some seal or whale hunting schooner. Their hair was cut short, as in civilized races, and some of them wore only a moustache. Others, like the old man in the photograph on p. 291, allowed the beard to grow. He had also bound a white handkerchief round his head—no doubt to keep off mosquitoes, for which purpose also skin gloves, even if not worn, were carried.

In person and appearance these natives were generally well built and of average height; and the old man on the left of photograph (p. 291) must have been a very fine specimen when young. The man on the right of the same photograph was the chief of the village, and wore a European coat, as did also the man in the middle of the same group, on the occasion of an important visit to the ship. This garment had been a very smart tailed coat in its time, and retained even in its old age a trace of its original smartness; but it fitted its present owner so poorly, that it is to be hoped he will stick closer to the much more graceful robe of reindeer-skin.

These natives wore skin nether garments of boots and breeches made in one piece, which enable them to traverse the marshes without the discomfort of getting wet, and must keep them very warm in the winter months. The breeches were tightened at the ankle by being tied with either a piece of string or hide. The women and children were variously clad. Generally the former wore a short skin robe and a man's breeches, as well as a belt with a knife attached to it; their heads were, however, protected by a handkerchief, instead of a hood like the men. Their hair was allowed to grow long, and some of them wore loose linen or cotton garments, sometimes tied at the waist with a belt. Some of these garments were very gaudy, and must have been obtained by trade or exchange. One of the main characteristics of these natives, as also of those of the island, was their unfailing politeness. They bowed and took off their caps with a grace and ease which seemed to come as naturally to them as to the most cultured members of civilized races, and the shake of the hands and the Russian salutation, "Zdrastee," seemed no more out of place among them than it would in the streets of St. Petersburg.

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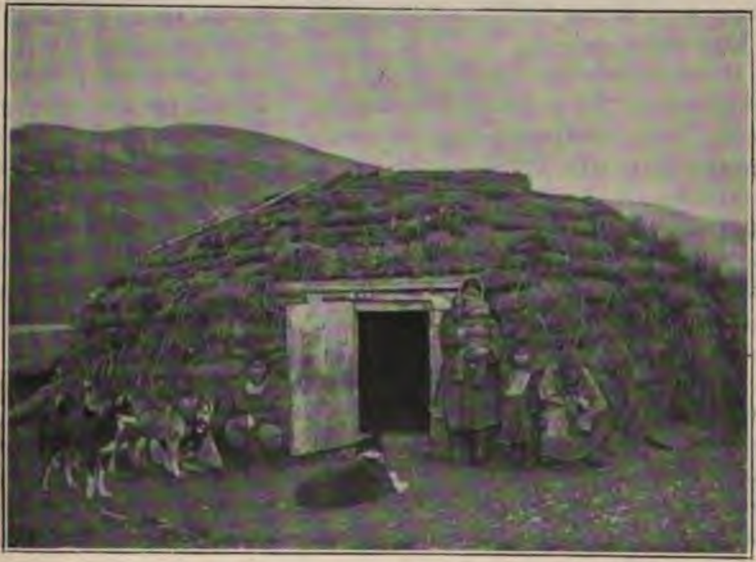
[*] See the Rev. John Batchelor's 'The Ainu of Japan,' chap. iv.

[†] See description of yurt, as seen on Karaginski island (p. 296).



A YURT AND FAMILY PARTY AT KARAGA VILLAGE.

They were not, however, as simple either in their manners or in their dress as the inhabitants of Karaginski island, whom they also excelled in being able to speak Russian fairly well, whereas the latter were only acquainted with a few words of the language, and that only in the case of a very few individuals.

In both cases a request to be allowed to take photographs was readily complied with, and permission granted to enter the dwellings. One old lady at Karaga, although quite blind,[*] left her *balagan* at our request, descended the rickety pole-ladder which led to it, and posed herself for a picture. In both cases European stores of various kinds were preferred to money, and in the case of the islanders money was refused. Lastly, the people of the two villages were similar in their desire for strong drink, the word "rhum" being a part of their somewhat limited European vocabulary.

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[*] The only other ailments noticed were lameness in the case of one young man at Karaginski, and a bad cough in the case of the old man at Karaga.

We did not see many of the household implements or weapons of these people. Besides knives, however, they all carried small leather bags, containing a piece of flint and tinder, and a heart-shaped piece of wood hollowed out to receive one or the other when a fire was to be lit.

As at Petropavlovsk, and elsewhere in lower Kamchatka, dug-out canoes were in use here; on Karaginski, however, skin boats only of various sizes were seen.

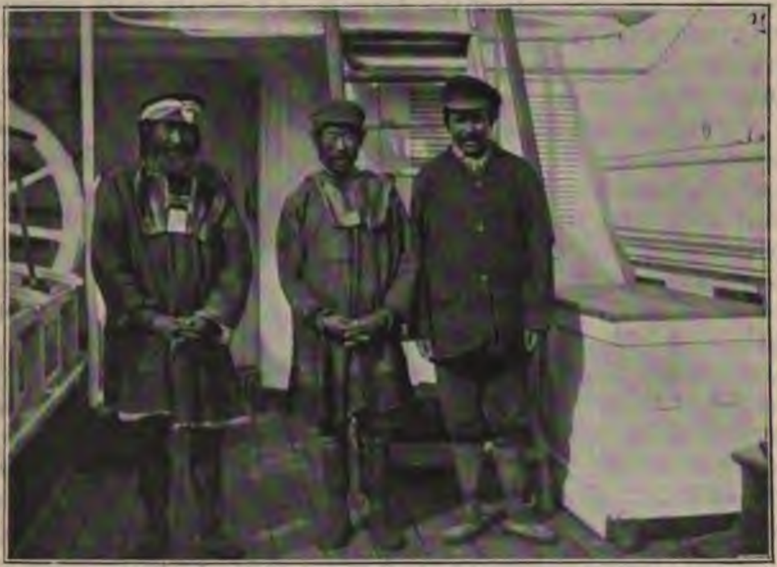
Domestic animals are few in kind at Karaga, but the number of individuals of the sledge-dogs makes some amends for the paucity of kinds. These brutes were of the usual Kamchatkan type, with prick ears and curly tails. Their colour was very variable, but, as remarked by Guillemard in his 'Cruise of the *Marchesa*,' many have a tendency to be white. There was no attempt to keep these dogs tied up, and they ran wild in all directions around the village, or lay about between or on the huts. Most of them, however, had small holes in the ground near their owners' dwellings, and in these they could lie quite snugly in any weather.

The presence of the dogs, of course, effectually prevents their owners from keeping fowl of any kind. We saw one light-coloured pony tethered in the village, and we were told that the natives possessed some cattle, but if that was so, we saw no trace of them, nor did we ascertain if they were the possessors of a herd of reindeer. Their main food at this time of the year would appear to consist of berries of various sorts and of fish.

Altogether, the people of this village were rather puzzling, and seem to present some of the characteristics in a mixed degree of Chukchis, Koriaks, and Kamchadales, the three little-known Mongolian races which alone are said to inhabit these regions. Their dwellings, however, were sufficiently Kamchadale in character to stamp them as members of that race. Indeed, it seems to be mainly by their habitations and in their language that these tribes are distinguishable *inter se*, their features and clothing being, to judge of the various accounts which have been given of them, not very distinct. Steller tells us that the Kamchadales are, in general, an undersized people, but some of these natives were tall and of very fair proportions. This, and the fact that some of the men were bearded, may show a mixture of blood in their veins, possibly traceable to the presence of the Russians for over a century in Kamchatka.

In dress also the inhabitants of Karaga village seem to show a mixture of blood and habits, for, if we are to believe Langsdorf ('Voyages,' part ii. p. 319, 1814), the hooded robe without an opening at the bosom, and with the ornamented breast-piece hanging down from the neck, is a characteristic of the Koriak, and not of the Kamchadale tribe.

Our shooting-parties at Karaga were not very successful, river-duck being as scarce as the sea-duck were abundant. Even, however, had the suitable kinds of duck been more numerous, they would probably not have afforded much sport, since most of this year's brood of such species as we saw were still either very young or in the flapper stage. The same applied also to the willow-grouse and ptarmigan, of which a few were brought in. No capercailzie or other game were seen, and the thick growth of scrub and grass must have made the bringing to bag of any big game almost an impossibility, even had such been obtainable near the village; though, as a matter of fact, big-horn and reindeer probably do not occur nearer than in the mountain chain, at a distance of perhaps two or three days' journey from the coast. Bear may, and probably do, occur on the lower ground, but at this time of the year in Kamchatka, food—in the shape of berries and fish—is so abundant, and vegetation so thick, that to bring one to bag must be a very difficult feat; add to which, that even in September the myriads of mosquitoes with which the country is infested make life almost unbearable. So it can be



NATIVES OF KARAGA VILLAGE ON BOARD H.M.S. "LINNET."

readily imagined that the life of a hunter of big game in Kamchatka, in August, is not exactly one of wholly unalloyed pleasure.

A seining party of bluejackets was very fortunate, easily securing about 600 lbs. of salmon, of the species locally known in Kamchatka as the haiko (*Onchorhynchus lagocephalus*). This, however, was not the only fish running at the time, for we obtained from the natiyes two or three fine examples of another species of the same genus, the kisutch (*O. sanguinolentus*). These two fish are the latest of the numerous Kamchatkan salmon to go up the rivers, and were at the time of our visit quite clean, and afforded excellent eating. The flesh is pale, and probably the best flavoured of any of the larger species of the genus, with the exception only of the chervichi, or king salmon (*O. orientalis*). The haikos caught on this occasion varied in weight from 6 to over 14 lbs., and we estimated the total weight of seventy of them as at least 600 lbs. A few small flat fish were also caught.

If salmon were numerous, hair-seals were almost equally so—of the species (*Phoca largha*), which in the Pacific takes the place of the common Atlantic harbour seal (*P. vitulina*). Of other mammals we saw no trace, and some traps which we set for small species secured nothing. A walrus head, with tusks weighing over 15 lbs., was purchased from the natives by one of our party.

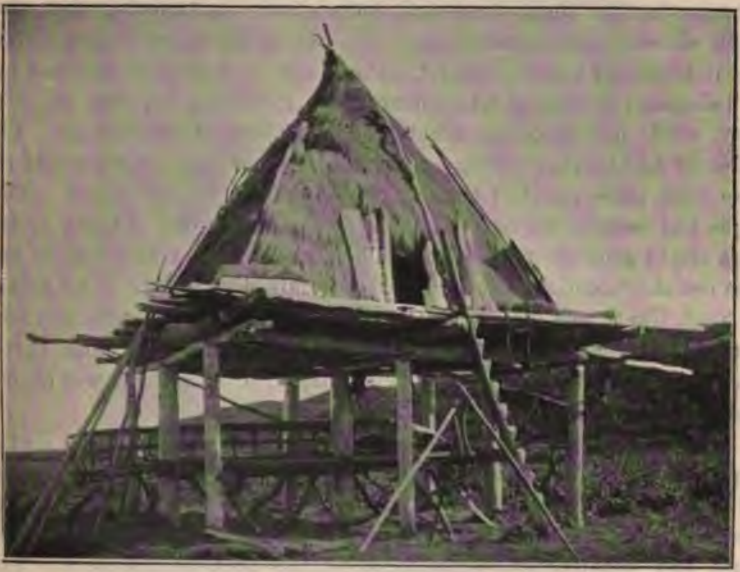
Birds of several species were fairly numerous, but our short stay prevented us from making a large collection. Besides those already mentioned, a crow (probably the Kamchatkan form of the carrion crow, *Conus corone levaillanti*) was fairly common, but was not obtained. Close to the village, flocks of large and very long-billed curlews (*Numenius*) found rich feeding on the berries, or at the edge of the small lagoon. Two or three species of gulls, the Red-legged (*Larus ridibundus*), the Common (*L. canus*), and another, were obtained, and the shooting-party reported finding the breeding-place of one species up the river. A grey and a pied wagtail were also plentiful, and two or three other small species were seen. Wading birds of several kinds were also obtained, but perhaps the most conspicuous bird of all was a large diver (*Urinator*), whose long uncouth body, flying with slightly bent back, rapidly beating pinions, and hoarse croaking cries, was hardly ever out of our sight or hearing.

Insects were pretty numerous, and a small collection was made and brought home; and for a botanist a fairly rich field lay open, but we had very little time for noting the vegetation. The shrubs and trees consisted of alders, willows, dwarfed examples of a mountain ash, and of a small pine, as at Petropavlovsk. The other vegetation was very similar to that of Petropavlovsk, but far poorer in species, though the grass and scrub was every bit as luxuriant. Berries were plentiful, and included the "morushka" and several other kinds. A large pink willow herb (*Epilobium*), a large yellow arnica, the white arctic ox-eye daisy (*Chrysanthemum arcticum*), and a blue polemonium were among the most conspicuous flowering plants.

At 11 a.m. on August 22, we steamed across the 25-mile channel which separates Karaga harbour from False bay, in Karaginski island, and anchored in the latter at about 4.30 p.m. of the same day.

The only excitement of the passage was the sighting of a walrus and its young lying on the sandspit which forms the harbour. A boat was lowered to go after them, but the animals winded us and took to the sea.

False bay and harbour are formed by a spit of sand extending in a south-westerly direction from the western coast of the island, rather near its north-western extremity, on the side of Ukinsk bay opposite to Karaga harbour. It is well protected from winds except from south to west. There is no bar, and there is a depth of 9 fathoms of water, gradually lessening to 5 at a distance of about 2 miles from the head of the bay, where the water rapidly shoals to 1½ fathom. The holding-ground is good.



A BALAGAN ON KARAGINSKI ISLAND.

In the harbour we were easily able to make out a few scattered balagans—not gathered together to form a village as at Karaga—as well as, what was quite unexpected, a rectangular log-built building, looking just like the store of some company. The meaning of this was afterwards explained to us by the natives, who informed us that some twenty or thirty years ago an American schooner had landed a party of men here, and that they had built the store to hold the skins and ivory which they took while on the island. According to the account of the natives, they quite "cleared the place out" of walrus, which explains the fact that we saw only two. The natives, however, had a few tusks for sale.

It was not long before an exploring and reconnoitring party left the ship, and our experience on shore well repaid us for the many miles of ocean which we had travelled to reach this spot. As we landed near one of the balagans, a party of eight or ten of the inhabitants of the island came down to the beach to meet us, and formed about as strange looking a company of human beings as it would be possible to imagine. Dark-haired and dark-eyed, of more than average height, with intelligent countenances, and blessed with an equal or even greater share of the gift of courtesy than the people of Karaga, it was not only in their manners, but in their dress and houses and implements, that these people showed their quaintness. The whole male population did not appear to exceed a dozen souls,* and we saw no women or children near the balagans; in fact, it was not until the following day that one of our party, while out shooting, accidentally met one of the former. They evidently had another village somewhere inland, and we were told that there were more people living at the other side of the island. These people had usually no hair on their faces, though one of them at least had a slight growth of whiskers. Their straight dark hair was in some cases cut short, and in others allowed to fall downwards on all sides of the head, like a mop, and with a length which was evidently not much short of that allowed to it by nature. One man had a circular portion of his head cropped fairly close, while the rest of his hair was allowed to grow long.

In dress they were far more primitive and simple than the Karaga people, and, with the exception of one or two very ancient peaked caps and handkerchiefs, did not possess any European clothing. With the foregoing exceptions, all wore roughly made skin caps of no particular shape, and constructed so as to cover the back of the neck. This, together with the fact that all carried gloves made of skin and slung on to their skin robe, or—with the knife and fire-bag—on to the belt, gave us an early intimation of the numbers of mosquitoes to be expected. Nor were we disappointed. Even the natives here, while speaking to us, were constantly brushing the mosquitoes off their hands and faces.

For clothes these people wore the hooded robe of skin (the hairy side turned inwards), the flap in front being either ornamented with a square chessboard-like device made of different-coloured skins, or fringed with fur, or in many cases quite plain. As in the case of the Karaga people, their beautifully made skin breeches and boots were so constructed as to form one article of clothing.

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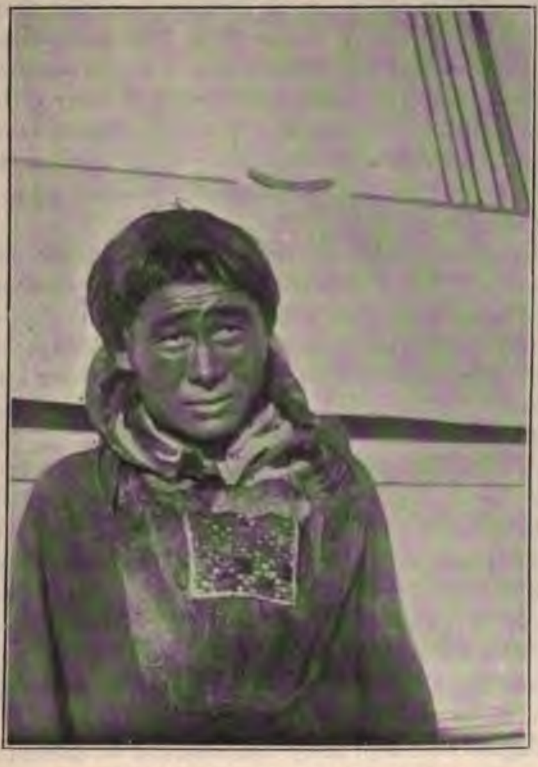
* At Petropavlovsk we were informed that only one family is said to exist in this village, but the presence of two old men makes it seem likely that there are at least two families. One of these old men, whose knowledge of Russian was better than that of his countrymen, was always put forward as interpreter when any difficult topic of conversation came up.

These people are said to have followed their reindeer over from the mainland during a winter, in which the straits were frozen over, and to have been unable to return whence they came, there having been, since they crossed, no frost severe enough to enable them to travel on the ice. Whether this story is true or not, we are unable to say, but it was told to us in Petropavlowsk. The people themselves seemed to us to be very different from those whom we saw at Karaga. They told us that their reindeer were in the hills at a distance of one or two days' journey from the village; besides reindeer, they possessed the usual type of sledge-dogs, but we saw no trace of any other domestic animals.



TYPE OF INHABITANT OF KARAGINSKI ISLAND.

Their features seem to resemble very closely those of the Chukchis of Indian Point, of whom we possess a photograph, and their stature was certainly far superior to that ordinarily ascribed to the Kamchadales. On the other hand, their habitations were distinctly Kamchadale, and bore no resemblance either to those of the tent-dwelling Chukchi or to the conical skin-covered huts of the Koriaks as described by Langsdorf, yet their dress was that which is said to be distinctive of the latter people. If the story of their having crossed over to the island from the mainland be true, they may be a party of Chukchis, or Koriaks, who, having wandered down from the bare northern tundra to a region where trees exist and wood is procurable, have adopted the Kamchadale form of dwelling. The absence of women from the main village would support this supposition, for if we remember rightly, the Koriaks are said to keep their women apart.

Only a few of these natives speak Russian,* and this they pronounce so badly that even our native hunter from Petropavlovsk could hardly understand them, so that our conversation was of a somewhat strange character. They, however, made up for their poverty of language by breaking into peals of the most hearty and unaffected laughter. The effect was catching, and soon we ourselves, as well as the Russian hunter, joined in, every simple sentence or question being terminated by a burst of laughter.

The balagans were here very similar to those of the mainland, and the people also eat fish and berries. We also saw one man eating a cone of the small dwarf pine, which here grows in close-set thickets. The only yurt we could see near this straggling village had a curious entrance to it from the roof, with a door which could be raised or lowered by means of an attached pole. It was exactly like the winter habitations figured in Cook's Third Voyage, but differed from them in not possessing a door at the side for the use of the women. We looked into this yurt, but did not descend the notched pole, which, as in the case of the balagans, formed the only means of ingress. The interior was bare, and there was a puddle in the centre of the floor, which gave it the appearance of not having been recently inhabited — an assumption which gains support from the presence of a hole in the ground for use as a fireplace near one of the balagans, and also from the fact that we saw the natives eating a meal of dried salmon seated on skins on the beach, under the shelter of their upturned *bidarra*, or skin boat.

In the balagans were kept many treasures, and we entered one and proceeded to investigate its contents. Among these we found the skins of reindeer, bear, and red fox, and we were informed that white foxes are also caught. The foxes are secured in an original kind of trap of a make very similar to that figured by Guillemard in 'The Cruise of the *Marchesa*' (1st edit., vol. i. p. 162), which he noticed on the Kamchatka river at Uskovska. It is said that bears are also caught in traps of the same description, though of a larger size. We saw no skins of the fur seal.

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* We noticed that, while conversing among themselves, a few simple Russian words seemed to be used by the natives, sandwiched between the words of their own language.

They keep their more precious or breakable household goods in bags, beautifully constructed either of the skin of the common hair seal (*Phoca largha*) or of the rare ribbon seal (*Phoca equestris*). One of the bags made of the latter skin we secured, and we were told that the species occurs on the Pacific coast of the island. In one of these bags we found a rough wooden box containing some writings in Russian, which we were unable to read, but which may have been left by the crew of the schooner by whom the log hut was built.

NATIVES OF KARAGINSKI ISLAND ON BOARD H.M.S. "LINNET."

The skins of the walrus and of a larger species of seal which occurs here—perhaps *Phoca barbata*—were kept stretched on frames for use in the manufacture of the skin boats, which will be described below.

Other implements which we noticed were snowshoes; a wooden tripod to stand over a fire, having wooden flesh-hooks suspended to it; a wooden ladle; and some bone knives, which are used for killing seals or other game when wounded. Spears they also possessed, whose steel points were carefully protected, when not in use, with caps made of skin. Perhaps the quaintest of all their possessions were two strange-looking shooting instruments (we use the word advisedly), consisting of an old iron barrel roughly fitted into a wooden stock, and fired by means of a flint. These had a prop attached to the forepart of the stock, on which to rest the instrument when being fired. In connection with these strange weapons were kept a varied assortment of bullets-bags and powder-horns—the latter made of the horns of the Kamchatkan big-horn (*Ovis nivicola*), as well as sight-protectors very carefully made of bone, and skin covers for the gun-locks. A hair seal was shot with one of these guns during our stay, and we obtained the carcase. When hunting, the natives seem to go armed with both spear and gun, as at least two of them, whom we saw returning to the village, carried both weapons.

The snowshoes, both at Karaga and on the island, were of the latticed North American type, and quite different to those in use in the neighbourhood of Petropavlovsk, which consist of a long light framework, rectangular in shape, and covered with walrus or hair seal-skin, the skin being brought to a point at the ends, and the hair being laid backwards to facilitate hill-climbing.

The natives came off to the ship in a skin boat, or *bidarra*, large enough to hold them all, and capable of sailing when the wind was suitable. This boat was broader, and did not stand so high out of the water, as those which we had seen in use as lighters on the Pribiloff islands. She carried a painter of hide, by means of which they made her fast to the ship. When not sailing, she was propelled by a set of narrow-bladed oars, and the steersman used a broad one instead of a rudder. We also saw smaller skin boats capable of carrying one man, and technically known in the Aleutian islands as "one-hole bidarkis."

Probably the quaintest sight we have ever seen, or ever will again see, was this skin boat with its uncouth crew of skin-clad natives paddling off to the ship, the paddles not moving together like those of an English boat, but by sides, port alternating with starboard, like the legs of an American pacer. Could the writer of 'Punch's Prehistoric Peeps' have been with us, he could hardly have failed to recognize in the originals what he had only drawn from imagination, a striking compliment to the faithfulness of his invention. Almost quainter still was the grave and courteous bow with which their interview with the captain began and ended, and their consumption of an impromptu meal of tea, biscuit, and various scraps served out to them by the bluejackets, was the source of much amusement forward.

On August 23 the weather was again brilliant and warm, and several parties left the ship, as at Karaga, in pursuit of sport or natural history. The former, although under the guidance of a native* of the island, were not successful. The reindeer were said to be in the hills at the north of the island, the thick undergrowth effectually prevented the pursuit of bears, and, although a good many duck were seen, these were chiefly of non-edible kinds, such as the Scaup and the fine King Eider (*Somateria spectabilis*). Some geese were seen, but not secured, and the bag consisted mainly of a few couple of willow-grouse.

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* This gentleman's love of berries was the source of many halts and not inconsiderable delay while he filled himself with his favourite food.

The naturalists' party was far more successful, and struck across the undulating country which rises gradually from the western coast escarpment to the mountains on the eastern side of the island. Here the ground was thickly covered with an undergrowth consisting of scrubby pines, as at Petropavlowsk, mountain ash, alder, and willow—the pine thickets being especially dense, and bearing out Guillemard's description of the similar thickets near Cape Shipunski (see 'Cruise of the *Marchesa*,' 1st edit., vol. i. p. 212). Between these thickets were small glades thickly covered with grass and several species of flowering plants, and forming the only means of passage over the country. Here any number of bear and other game might easily have lain hid, secure from all disturbance, and the solitary willow-grouse which we surprised and shot must be regarded as a very lucky addition to the bag. In the thickets we were surprised to find several kinds of warblers and small birds, all, however, very difficult to secure in such a country. We were disappointed not to meet with any eagles on Karaginski island, as we had hoped to find the rare *Haliætus hypoleucus* of Ridgeway there. If eagles occur on Karaginski island, it can only be on the more precipitous eastern side of it, which we were unable to visit. Richardson's skua was here seen and shot as at Karaga, and a Lapland Bunting was also obtained. In other respects the birds seen or shot were the same as those of Karaga.

Besides the trees and shrubs already mentioned, we noted many plants with which we were already familiar on Bering and Copper islands, such as some umbellifers, a red musk thistle, a conspicuous geranium, a large pink willow herb (*Epilobium*), a blue iris (*Iris ? Sibirica*), a polemonium, golden rod, rhododendron, nettle, tansy, equisetum, with many berry-bearing plants, including conus, empetrum, the "morushka," and the "hurtz."

Among the wealth of attractive flowers two species of humble bees were busily reaping an abundant harvest, and we saw also three species of butterflies—a tortoiseshell (*Vanessa*), a garden white (*Pieris*), and a yellow species—two bronze dragon-flies, and several species of flies, beetles, and spiders, a small collection of which was brought home.

Under the hot afternoon sun, the mosquitoes became so troublesome that we were glad to go on board the ship somewhat earlier than we had intended, and on August 24 at 6 a.m. we weighed anchor and sailed for Petropavlowsk, regretting that our acquaintance with such a quaint and simple-minded people and an almost wholly unknown country should have been such a short one.

AFRICAN BOOKS OF 1897–98.

By EDWARD HEAWOOD, M.A.

In passing under review the principal works relating to Africa which have appeared within the last twelve months, it may be well to group them according to the broad subdivisions of the continent to which they refer. The greater number will be found to deal with one or other of the British African possessions, British travellers having been of late unusually prolific in narratives of their experiences, and it is satisfactory to see that the parts of Africa with which we are most concerned as a nation are acquiring so extensive a literature of their own.

Beginning with South Africa, we may single out one from the numerous works called into being by the late critical times as especially valuable from the geographical point of view.* In giving to the public an account of the present condition and prospects of South Africa as seen in a journey from Cape Town to the Zambezi and back to the East Coast, Mr. Bryce shows the true feeling of a geographer in the best sense of the term. At the outset he draws a striking picture of Nature in the region dealt with, firstly in its broader outlines, and afterwards more in detail in respect of its separate political units. He then deals with South African history in the light of the physical facts observed, adding in the third part the more immediate results of his own inquiries, and finishing with a masterly discussion of some of the most important social and political questions which affect the future prosperity of the country. Throughout the book the author takes much pains to present the true causes of observed phenomena, and thus gives an unusually clear view of the relation of the political to the physical geography of the region.

Captain Younghusband's book,† forming a reprint of letters and telegrams addressed by him to the *Times* while representing that journal in South Africa, is less elaborate than Mr. Bryce's, and is written rather from a political than a geographical point of view. It contains some vivid sketches of the present condition of the country, and a thoughtful study of the outlook both in the Transvaal and in Rhodesia. The bulk of the settlers in the latter are, he considers, far from being ardent Imperialists, though attached to the mother country; they at present hold to the Chartered Company for what it can do for them, but hope in the future to form themselves into one of our great self-governing colonies.

Coming next to a remote corner of the South African interior, we have to notice the record of M. Coillard's devoted labours, as an agent of the Evangelical Missionary Society of Paris, in the kingdom of the Barotse potentate, Lewanika. This work is published both in

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* 'Impressions of South Africa.' By James Bryce. London: Macmillan. 1897.

† 'South Africa of To-day.' By Captain Francis Younghusband, C.I.E. London: Macmillan. 1898.

English [*] and French,[†] the subject-matter being in the main the same. It is written in a simple and straightforward style, which at once arouses our sympathy, and records a long and arduous fight against difficulties, which must have called for qualities of a very high order. It contains a mine of interesting information respecting the Barotse and their king, who, in the extraordinary mixture of good and evil presented by his character, seemed to M. Coillard an exact counterpart of Mtesa, as portrayed by Mackay. The area over which his influence extends is estimated by M. Coillard at 200,000 square miles, though the tribes which pay tribute by no means form a homogeneous nation. The physical character of the Barotse plain—flooded during a large part of the year, so that all communication is carried on by canoe—is well described, and one of the later chapters contains the account of a canoe-voyage on the upper Zambezi, noteworthy from the fact that, since Livingstone's first great exploring expedition, not a single European had ascended its higher portion, though the French traveller's example has lately, we believe, been followed by Major Gould Adams. M. Coillard is an enthusiastic photographer, and both the English and French editions are abundantly illustrated from his negatives.

A second book dealing with the Barotse kingdom, is that of Major Gibbons,[‡] whose exploration of the eastern tributaries of the upper Zambezi is already well known to our readers. The major was fortunate enough to secure Lewanika's interest in his explorations—the king remembered Livingstone's work of the same kind—and he is thus inclined to speak favourably of the African potentate. The narrative is written in a fresh and attractive style, with an abundance of sporting incidents for those who look principally for adventure in books of travel. Geographically, the most important journey was that to the Mashukulumwe country, on the upper Kafukwe, which proved a large stream. An interesting piece of exploration still remains to be done in the tracing of its upper course, which we may hope Major Gibbons will accomplish by his present expedition. The author has some interesting remarks on the Matoka plateau, lying between the Kafukwe and the Zambezi, which he regards as a favoured spot for white settlers in the future, whilst a railway to the Zambezi would render its abundant crops a valuable resource in the case of scarcity in Matabililand.

Still another addition to the literature of the upper Zambezi has lately been made by the work of M. Bertrand, of Geneva,[§] which describes a journey made partly in company with Major Gibbons. It is handsomely got up, and embellished with a large number of illustrations from the author's photographs. Much of the book describes parts of South Africa now fairly well known, but the seventh chapter deals with a previously untraversed region, and is thus of original value. An appendix devoted to the Barotse, their customs and history, also contains some useful matter.

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[*] 'On the Threshold of Central Africa.' London: Hodder & Stoughton. 1897.

[†] 'Sur le Haut Zambèze.' Paris: Berger-Levrault. 1898.

[‡] 'Exploration and Hunting in Central Africa.' By A. St. H. Gibbons. London: Methuen. 1898.

[§] 'Aus Pays des Ba-Rotse, Haut-Zambèze.' Paris: Hachette. 1898.

A connecting link between South and East Africa is supplied by M. Dècle's important work,[*] which describes journeys extending over 7000 miles, and reaching from the Cape to beyond the equator. The author, who had almost from childhood been devoted to travel, and had acquired an extensive acquaintance with many of the countries of Europe, Asia, and North America, was in 1890 entrusted by the French Government with a mission in South and East Africa, for the study of the ethnology of those regions. In the course of his three years' wanderings, M. Dècle was led to extend his routes, first to the Zambezi and Lake Nyasa, and subsequently to Tanganyika and the Victoria Nyanza, reaching even the borders of Unyoro. He thus gained an unusually wide experience of African countries and peoples, and, while not claiming the title of an explorer, is able to give a general view of a large part of the continent at the time when it was just emerging from its original barbarism, and being brought under the new *régime* of settled government by the white man. He has striven, and with success, to make his book generally useful, keeping his own adventures more or less in the background. He approaches his subject entirely without bias, and has some outspoken remarks on various problems connected with the future of the continent, such as the introduction of Christianity and the suppression of the slave-trade. His estimate of the character of King Khama is by no means so favourable as that put forward in other quarters; but, while his ideas may not meet with universal acceptance, they no doubt supply a useful corrective to the over-sanguine estimates which have been formed by more or less biased advocates. The book is fully provided with maps and illustrations.

Of books devoted exclusively to East Africa, Mr. FitzGerald's profusely illustrated volume[†] deserves to be mentioned first, as forming not a mere record of adventure, but a work of solid value as an authority on the agricultural resources of the British East African coast. The author, who had previously gained a wide experience of tropical agriculture in South India, was sent out by the British East Africa Company in 1891 to report on the agricultural capabilities of the country, and these formed his study during the two succeeding years, devoted partly to agricultural experiments at the Magarini plantations ("Shambas") taken over by the company, and partly to travel with a view to the examination of the country generally—its natural resources and suitability for agricultural undertakings. The northern part of the coastlands within the British sphere had previously been little known, so that Mr. FitzGerald's explorations, which extended up to Port Durnford, have made some positive additions to our knowledge, as will be seen from the series of large-scale maps constructed by Mr. Reeves. As practically nothing had before been published with respect to these journeys, the appearance of the book, though somewhat delayed, is most welcome. In the second part of the book, Mr. FitzGerald deals with Zanzibar and Pemba, describing fully the methods of clove cultivation, and discussing the possibility of the introduction of new products. There are also some useful appendices giving technical details respecting the various fibre and rubber producing plants, etc., to which attention might be paid in East Africa. The general conclusion arrived at is that British East Africa affords a fine field for the cultivation of tropical products, if once the labour question can be solved by the introduction of coolies from India.

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[*] 'Three Years in Savage Africa.' By Lionel Dècle. London: Methuen. 1898.

[†] 'Travels in the Coastlands of British East Africa and the Islands of Zanzibar and Pemba.' By W. W. A. FitzGerald. London: Chapman and Hall. 18

Another work describing travels in East Africa, of which little had previously been made known to the public, is that of Mr. A. H. Neumann,* who in 1893–94 undertook two expeditions into the interior, penetrating finally as far as the north end of Lake Rudolf. A keen sportsman, and finding the advance of civilization in South Africa inimical to his favourite pursuits, Mr. Neumann landed at Mombasa, with a view to wooing Nature in her most inaccessible wilds. Dealing as it does with parts of the continent still so little trodden by white men, the book presents much that is novel and interesting, though to non-sportsmen it is perhaps somewhat marred by its tales of wholesale butchery of the noblest African game. The author himself pleads guilty to the charge of cruelty, though the blame might perhaps more justly be laid to an undue prominence of the "organ of destructiveness," which seems to find its satisfaction in proportion to the nobility of the object on which it is exercised. Future generations of nature-lovers will, we imagine, be little disposed to bless the memory of those possessed of it. Apart from this, however, there is much in the book that well repays perusal. Although the author made no scientific survey, he shows considerable powers of observation, and records many interesting facts respecting the natives with whom he came in contact, the habits of animals, and the country itself. The description of the shores of Lake Rudolf is of special interest. During the passage of the desolate lava-strewn country to the south-east of the lake a strong gale blew incessantly, making things thoroughly uncomfortable. The lake, however, was most beautiful; it seemed deep at its southern end, and its water proved quite drinkable, though possessing some unusual qualities. Before reaching it a glimpse was obtained of the lake since discovered by Mr. Cavendish, while a conical peak was seen in about the position of Teleki's volcano, showing, however, no sign of activity. There are some striking illustrations of animal life, and the map is clearly drawn, though not very detailed.

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* 'Elephant Hunting in East Equatorial Africa.' By Arthur H. Neumann. n: Rowland Ward. 1898.

British East Africa is again the subject of the first part of Lieut. Vandeleur's book,* which gives a readable narrative of his work on the Nile and Niger already well known to our readers. Although largely a record of fighting, there are many incidental details respecting the countries traversed, those regarding the Nandi district, east of Uganda, being perhaps of most value. The book is useful as the most recent account of the state of the Upper Nile region previous to the Sudanese mutiny. A thoughtful essay by Sir George Goldie sums up in a striking manner the problem connected with the opening up of the continent by European nations, with especial reference to the Nigerian Sudan, while the author gives a chapter on the history of European enterprise in the same region. He calls attention to the remarkable insight displayed by Mr. M'Queen in writing of the Niger in 1821, though he fails to mention that an earlier writer, the German Reichard, had correctly placed the termination of the river in the bight of Benin.

One or two more East African books remain to be spoken of before proceeding to others concerned with the West. The narrative of Mr. Rodd's mission to Menelik is brightly told by Count Gleichen,† with many humorous touches relating to the hundred and one difficulties and trials which beset the African traveller. The book supplies some useful information respecting the rise to power of the Abyssinian empire, and sketches of the life of the inhabitants. It adds another to the portraits of African potentates already alluded to,‡ in the character sketch which it gives of King Menelik, who is described as a most enlightened as well as a strong ruler. A quotation from Colonel Wingate supplies an explanation of the frequent changes of the capital, as necessitated by the gradual destruction of the forest, whence fuel and building materials are obtained. A neighbouring region forms the subject of a lately published work by Prince Ghika,§ who with his father made a trip to Somaliland in 1895–96. It is mainly a record of hunting adventures, most of the illustrations, too, relating to the prince's numerous victims, though there are also one or two excellent representations of scenery. There is a good map by Prof. Paulitschke, and a description of the plants collected by Drs. Schweinfurth and Volkens.

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* 'Campaigning on the Upper Nile and Niger.' By Lieut. Seymour Vandeleur. London: Methuen. 1898.

† 'With the Mission to Menelik, 1897.' By Count Gleichen. London: E. Arnold. 1898.

‡ Lo-Bengula, as well as Khama, is described by M. Dècle, who says that, except the Czar Alexander, he has never seen a ruler of more imposing appearance.

§ 'Cinq Mois au Pays des Somalis.' By Prince N. D. Ghika. Geneva and Bale: Georg. 1898.

Turning now to West Africa, the most important work of the past twelve months is that of Lieut. Hourst,[*] who supplies a detailed narrative of his great journey from St. Louis to Timbuktu, and down the Niger to its mouth. It was, of course, only at Timbuktu that the chief geographical interest of the journey commenced, and the bulk of the book is taken up with the heroic struggles involved in the difficult passage of the Middle Niger, with its hostile population and numberless impediments of navigation. Some information of interest is however given in the first two chapters with regard to the older portion of the French Sudan, as the port for which the author regards Dakar as having a great future before it. Although the form of the narrative does not allow of much systematic geographical description, the book presents incidentally, aided by the abundant illustrations, a vivid idea of the varying nature of the great West African river, while the information respecting that interesting people, the Tuareg, is perhaps its most valuable feature. The author puts forward his ideas as to the best mode of bringing this warlike people under French influence, holding that the Awellimiden, who form under their chief Madidu the best organized and most powerful confederation of that stock, should be utilized to keep in check their more turbulent neighbours. As might be expected, Lieut. Hourst has some bitter things to say with regard to the Royal Niger Company and its mode of action, though he has no fault to find with individual Englishmen with whom he came in contact. His contrast of the progress made by his countrymen on the upper Niger with the work accomplished by the British on the lower river, is, many will be surprised to hear, very much to the disadvantage of the latter.

One other book of travels remains to be mentioned, viz. Colonel Trotter's account of the proceedings of the Anglo-French Commission for the demarcation of the Sierra Leone boundary.[†] The interior parts of that colony were previously so little known that the labours of the commission resulted in a large amount of fresh geographical information, the most important features of which have already been laid before our readers. Colonel Trotter now places before the public in a handy-sized volume a pleasantly written narrative of the doings of the commission, combined with further details on the geography of the country passed through, its inhabitants, and their mode of life.

One or two works dealing with special subjects have also appeared during the past year. Dr. A. Poskin[‡] has collected a large amount of information on the climatology of Tropical Africa in its relation to disease, elucidating the subject from his own experience as medical officer on the staff of the Congo railway. He begins with a sketch of the physical features and meteorology of the region in question, coming afterwards to the consideration of diseases and the rules of hygiene which should be followed. His views by no means coincide with those of Dr. Sambon lately placed before our Society, for he speaks of the intimate relations which exist between the climate and the special diseases of Tropical Africa. He points out that the purity of the air depends on such factors as the configuration of the soil, its geology, vegetation, etc., in which respects the situation of Equatorial Africa is markedly unfavourable, while certain maladies, such as heat apoplexy and tropical anemia, are classed by him as distinctly climatic.

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[*] 'Sur le Niger et au Pays des Touaregs. La Mission Hourst.' Par le Lieut. de vaisseau Hourst. Paris: Plon. 1898.

[†] 'The Niger Sources and the Borders of the New Sierra Leone Protectorate.' By Lieut.-Colonel J. K. Trotter, R.A. London: Methuen. 1897.

[‡] 'L'Afrique Equatoriale, Climatologie, Nosologie, Hygiène.' Par le Dr. A. Poskin : Soc. Belge de Librairie. 1897.

A useful contribution to the history of the opening up of Africa is supplied by Dr. H. Dehérain,[*] who describes the conquest of the Egyptian Sudan under Mehemet Ali. This is a chapter of African history which is by no means widely known, and one which derives a special interest from the present military operations in the same region. There is an instructive chapter on Khartum, and the advantages and disadvantages of its geographical position, while the influence which Mehemet Ali's schemes had on subsequent events in the Sudan is clearly traced. Lastly, M. Victor Deville has lately published a concise sketch of the exploration and partition of Africa,[†] written from a decidedly French standpoint, but apparently reliable as to facts. He allows that the British, Germans, and Belgians have secured a better position than the French as regards the agricultural and commercial benefits to be derived from Africa, and impresses on his countrymen the need of learning a lesson from their rivals.

THE OLD BEDS OF THE AMU-DARIA.[‡]

By P. KROPOTKIN.

Within the last few years the Russian Geographical Society has published, besides a number of papers, two important works on the lower course of the Amu and the Transcaspian lowlands, namely, 'The Old Beds of the Amu-daria,' by Baron Kaulbars (*Izvestia*, vol. xvii. p. 4); and 'The Transcaspian Lowlands,' by M. Obrucheff (*Memoirs*, General Geography, 1890). A third work of equal importance, 'Discussion of the Question relative to the Old Course of the Amu-daria,' by A. M. Konshin, is now added to the above.[§] The three works, together with the excellent articles of Prince Hedroits * and M. Lessar, give a pretty complete idea of the present state of our knowledge of the matter, and while they do not yet entirely settle the question, they settle it, at least, upon one important point, namely, the extension of the Caspian sea eastwards, into the Transcaspian territory, within the Post-Pliocene age. The matter has been mentioned more than once in the pages of the *Proceedings R.G.S.* and the *Geographical Journal*; but it seems to me to deserve mention once more.

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[*] 'Le Soudan Egyptien sous Mehemet Ali.' Paris: Carre & Naud. 1898.

[†] 'Partage de l'Afrique. Exploration, Colonization, Etat Politique.' Paris: Librairie Africaine et Coloniale (André). 1898.

[‡] Map, p. 336.

[§] 'Razyasnenie Voprosa o drevnem techenii Amu-darii,' separate issue from the *Memoirs*, General Geography, vol. xxxiii., 1897, 256 pages, with several maps and drawings: namely, a geological map of the Transcaspian lowlands, 66⅔ miles

Before the year 1883, it was generally believed that the river-like bed of the Uzboi represents an old bed of the Amu-daria, which turned westwards and south-westwards before reaching Lake Aral, and flowed into the Caspian sea. It is still traced as such on many maps. Another "old bed" of the Amu, the Ungus, was traced in a western direction, from Charjui across the Kara-kum desert; and a third "old bed" was supposed to be seen along the line of Akhal-teke oases which is now followed by the Transcaspian railway. A number of similar elongated ravines, which had been discovered in the Kara-kum sands, were also described as so many traces of the old beds of the great river. This is still the point of view which is held by Kaulbars, who considers that the Amu ran first in a valley at the foot of the Kopet-dagh, then was gradually deflected to the right, so as to flow along the Ungus, and finally took its present course due north-westwards from Charjui, sending, however, an arm to the west, at Pitnyak, which arm discharged its waters through the Uzboi into the Caspian sea.

The investigations and surveys of the Amu-daria expedition threw the first doubts upon this conception. While it was evident that a branch of the Amu once reached the Sary-kamysh depression (situated in the latitude of 41°–42° N. to the south-south-west of Lake Aral), it was found by no means certain that the western part to the Uzboi (from Balla-ishem westwards) should ever have been a river-bed. And when the mining engineer, A. Konshin, visited the same regions, he expressed, in 1883, the idea that, instead of tracing old beds of the Amu as far as the present eastern shores of the Caspian, we must look for a wide extension of the Caspian sea into the Transcaspian depression. The discovery of shells, now living in the Caspian, at a distance of about 100 miles inland, at altitudes of 140 to 280 feet above the present level of the Caspian, gave support to this hypothesis. It met, however, at the outset, with considerable opposition; the generalizations of Konshin were sharply criticized, and bitter polemics ensued between him and even such an explorer as M. Obrucheff, who also denies the fluviatile origin of parts of the Ungus and the Uzboi, but differs from M. Konshin upon several other points.

The volume now issued by M. Konshin bears ample traces of these polemics, but on the whole it contains a good summing up of the data upon which the hypothesis of the eastward extension of the Caspian is now based.

In order to give an idea of the present state of the question, it will, perhaps, be best to sum up (in M. Konshin's words) the opinions of the different explorers:—

> "Glukhovsky and Svintsoff," he writes, "have no doubts that the Uzboi for its full length, from the present Amu down to the present shore of the Caspian, was the old bed of the classical Oxus, and that there is no other old bed of the Amu in the Transcaspian territory.

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inch; two maps of the Uzboi, according to the surveys of 1874 and 1884; a profile of the land between Kizil-arvat and Balla-ishem; a map of the old sea-beaches of the Caspian on the slopes of the Great Balkhan mountains; a plan of the Ungus; a map of the different stages of retreat of the Caspian at different epochs, according to the [illegible] ews, and a number of small plans and drawings.

[illegible] vols. xviii. and xix.

"Hedroits, and especially Lessar, categorically maintain, on the contrary, that the Uzboi was not a direct continuation of any one of the Khiva beds of the Amu, but only discharged into the Caspian those waters of Lake Aral, which accumulated in the Sary-kamysh depression; at the same time, Hedroits believes that the Amu flowed along the Ungus, which supposition is not accepted by Lessar.

"Kaulbars and Annenkoff positively maintain that the Uzboi was the old bed of the Amu, and that not only those branches of the Amu which watered the Khiva oasis were discharged through it, but also that branch of the Amu which ran along the Ungus; the branch which ran from Charjui along the saline depressions (*shors*), now seen at the foot of the Kopet-dagh, also joined it in its western part.

"Obrucheff differs from all the above in admitting that the western part of the Uzboi, from Lake Topatian (situated due north of the Kazanjik railway station), was a Caspian gulf, while its eastern part was an old bed of the Amu; and he sees the head of the Uzboi in the modern salted lake Kapilarn-kul. He maintains, also, that there was a time when the Amu ran through the western portion of the Kara-kums and covered this region with its delta-deposits.

"Bogdanovich differs from all other explorers in considering the western Uzboi as a mere ravine due to the action of rain.

"As to me, I categorically denied in my earliest reports—first, that there are any traces of the Amu beds in the Kara-kums; and I maintained, next, that the Oxus always ran in the same direction, towards Lake Aral, as it flows now; that only on reaching the Aïbughir *chink* (escarpment) of the Ust-Urt, it began to branch off west and east, discharging its waters partly into Lake Aral and partly into the Sary-kamysh lakes, but not into the Caspian; that the supposed oscillations of the Amu were limited to the Sary-kamysh cone of its delta-deposits; and, finally, that the western Uzboi was, in its lower parts, the shore of a gulf of the Caspian, and in its upper portion a channel of discharge of water from the Sary-kamysh into the Caspian sea."

As to the Ungus, Svintsoff, who has levelled part of it and has crossed the Kara-kum plateau at its western end, denies the fluviatile origin of the Ungus, and he has in that the full support of Lessar. Kaulbars and Annenkoff see in the Ungus an old bed of the Amu, and they are supported by Obrucheff, who, however, finds that the part of the Ungus which he has visited near Shiikh, has rather the aspects of an old sea-beach. He believes, nevertheless, that in olden times the Amu watered the Aklal-teke oasis, and that its delta occupied what is now the Kara-kum Sands. And, finally, Hedroits sees in the Ungus the old Arax, but adds that if marine fossils be found in the Kara-kum Sands, he will abandon this view. As to M. Konshin, he considers the Ungus as a distinct sea-beach.

In order to best emphasize the difference of views relative to the lower Amu, it may be as well to give first Obrucheff's development of Kaulbars's hypothesis in Obrucheff's own words:—

"There is reason to believe," Obrucheff wrote in his important work, 'The Transcaspian Depression,' "that in the sandy region between Merv and Charjui the Amu-daria ran not only in the Repetek valley (Repetek is the first railway station in the south-west of Charjui), but even 40 miles further westwards—that is, past Uch-aji (next railway station), where it received the Murghab. Thus, the eastern part of the Transcaspian depression, which was land when the lake Aral already existed, was watered by the Amu and its tributaries, the Murghab and the Tejen. The Amu ran at that time from Kelif, along the Kelif-Uzboi, through Uch-aji, and then it bent westward into the above-mentioned basin of the Aral-Caspian. The Murghab joined it at Uch-aji, and the Tejen a little above its mouth. When the Kara-kum basin began to contract, the lowering of its level for each 10 *sajenes* (70 feet) resulted in laying dry, along the sea-shore, a strip of land from 35 to 50 miles wide, which was covered with dunes (marine), the latter holding back the water of the river and compelling it to divide into branches amongst the dunes. The *shors* (elongated saline depressions), which are seen on the southern border of the Kara-kum sands, are traces of these branches, which grew in length in proportion as the seashore retreated westwards. When the level of the Aral-Caspian basin was lowered by about 200 feet, the Kara-kum marine basin had nearly totally disappeared, and the Caspian sea was connected with the Aral-Sary-kamysh basin by means of a narrow strait. The Amu must have entered that strait, because one sees a series of *shors* on the way from Kizil-arvat to Igdy. When the sea-level sank another 20 feet, the Caspian became separated from the Aral-Sary-kamysh basin, and the Kara-kum strait became a gulf of the Caspian. When the level of the latter sank further by 120 feet, the Kara-kum gulf was reduced to half its former size, and its head was about the Perevalnaya station of the Transcaspian railway, and somewhat to the east of Lake Topiatan (in about 55° 40′ E. long.). Here we also find a series of *shors*, so that it would seem that three thousand years ago the Amu still crossed the Transcaspian depression and entered the Balkhany (or Kara-kum) gulf of the Caspian. Perhaps it sent off a branch near its junction with the Tejen, and this branch ran past Shiikh and Laily; but whether it was so, it is difficult to decide. However, as it is known that Khiva was founded 678 years before our era, and as Khiva could not exist without the Amu," Obrucheff concludes "that 2600 years before now one branch, at least, of the Amu must have run along its present bed, or a bed approximately similar to it, and reached the Sary-kamysh. About that time the Uzboi may have also been formed."

Although this hypothesis seems very probable at first sight, and would very well conciliate the doubtless eastward extension of the Caspian with the words of Herodotus, one must, however, recognize that under the present state of our knowledge of the Transcaspian region, it would be difficult to prove that things went in this way in the basin of the lower Amu. M. Konshin's contention is, in fact, that the Kara-kum sands are a purely marine formation—the bottom of a gulf of the Caspian, which nearly reached the Amu about Charjui. There are, he maintains, in this area no traces of fluviatile deposits, which might be considered as delta-deposits of the Amu. The Ungus is, in his opinion, the escarpment of a distinct sea-beach, and the *shors* along the Kopet-dagh are mere elongated remains of a retreating sea, having nowhere the appearance of a river-bed, and nowhere containing shells of fluviatile origin. On the contrary, the clays which fill up the lower part of the Kara-kum (between the Ungus and the oases at the foot of the Kopet-dagh) are exact counterparts of the clays which are seen in the western part of the same depression, where they contain shells identical with those which are now living in the Caspian sea. The surface of the Kara-kum Sands, which are all covered with hillocks and elongated rows of hills, 150 to 200 feet high, consisting of dirty yellow sand lying upon hard red clays, and intersected with deep salt-bearing depressions (*shors*) and hard *takyrs* of salted clay, is certainly quite different from the alluvial plains which one is accustomed to find in the deltas of mighty rivers.

As to the marine shells, M. Konshin has found, as is known, shells of *Cardium*, *Dreyssena*, *Neritina*, and *Hydrobia*—all living now in the Caspian sea—on a wide area, from the seashore to the 56th degree E. long., and up the Uzboi as far as the Sary-kamysh depression. They lie on the surface, and consequently have not been covered by subsequent delta-deposits of the Amu. In the Balkhan mountains they are found along distinct sea-beaches at altitudes of from 140 to 280 feet above the present level at the Caspian—these altitudes proving that in Post-Pliocene times the Caspian must have extended far inland over the Kara-kums. Moreover, the Ungus represents, M. Konshin remarks, an admirable sea-beach escarpment, having a length of 270 miles, and separating the Pliocene clays of the Kara-kum plateau from the Post-Pliocene sands and clays of the lower-lying Kara-kum Sands.

As to the Uzboi, which had been represented by the first surveyors, in 1874, as a river-bed, there is no doubt whatever at the present time, since it has been carefully mapped, levelled, and explored in 1883, that it never could have been a river-bed. The bottom of the Sary-kamysh depression lies much deeper than the bed of the Uzboi at Igdy, and altogether the Uzboi consists of two distinct parts—the Sary-kamysh basin which contains Amu-daria and Aral shells, and the southern and western part which contains marine Caspian shells.

To sum up the question, it may thus be accepted as nearly certain that there was a time in the Post-Pliocene age, when a long gulf of the Caspian sea protruded eastwards, nearly as far as the longitude of Merv, covering the Kara-kum sands (but not the Kara-kum plateau, in the north of the Ungus. At the same time another branch of the same gulf protruded northwards, along the Uzboi, probably as far as the Sary-kamysh. And it was at the same period that a long gulf of the Caspian extended up the present valley of the Volga nearly as far, or maybe even further than Kazañ. The question, however, remains, whether there was a time when the Amu entered this gulf, so as to join the Murghab. Probable though this supposition appears from the general configuration of the land, it has still to be proved by more detailed research.

The next question, which also can only be solved by further detailed exploration of the Kara-kum sands, is, whether the Amu continued to flow or to send a branch in a westerly direction when the Kara-kum gulf began to dry up. I will permit myself to remark that the mere presence of *shors* and *barkhans* does not prove the existence of such a bed, so long as the existence of true alluvial delta-deposits has not been ascertained.

And, finally, I would like to suggest another important question—whether the junction between the Caspian and the Aral was maintained only by way of the Uzboi and the Sary-kamysh depression? or, as appears to me very probable, there existed a northern connection between the two basins, either in an eastern direction from the Mortvy Kultuk gulf of the Caspian, along the yet imperfectly known chain of lakes which is marked on our maps, or somewhere in a south-eastern direction from the same gulf. An exploration of these chains of lakes seems to me quite urgent.

Only detailed exploration will give the necessary data for answering these important questions. In the meantime, we can only express our deep gratitude to the explorers of this interesting region, and especially to Prince Hedroits and M. Konshin who have made a serious step in the solution of the Amu-daria problem, by showing that its solution must be looked for, not only in changes of the bed of the river, but especially in an eastward extension of the Caspian sea itself.

THE MONTHLY RECORD.

EUROPE.

Language Boundaries in the Grisons and Ticino.—In the fifth number of *Petermanns Mitteilungen* for the current year, Dr. M. C. Menghius discusses the present language boundaries in the east of Switzerland, and their variations, as shown by the censuses of 1860, 1870, 1880, and 1888. Three languages are there represented—the German, Italian, and Rhæto-Romansh, the last-named, in its present extension, forming but a scanty remnant of a once more widely distributed tongue, which has for many years yielded before the inroads of the other two. At its widest extent, the Romansh occupied almost the whole region between the upper Rhone and the upper Drave, *i.e.* the greater part of the Roman province of Rhætia; but even at the beginning of the middle ages its boundaries were undergoing contraction, especially in Tirol, where German colonies occupied points, important strategically or otherwise; and whilst the German language has been encroaching from the north, the southern valleys, both in Tirol and the Grisons, have been Italianized. The limit of the compact area, with more than 80 per cent. of German-speaking population, runs now in part along the northern boundary of the canton of the Grisons, bending, however, south towards the Rhine, which it strikes near Tamins. Further east it runs still more to the south, and finally follows the watershed between the Rhine and the Inn. Within the German area, some districts show a recent increase in the foreign element, including the Romansh; but this is not by any means likely to gain a permanent footing, but rather to lose ground through the Germanizing of the immigrants. Within the Romansh area, which occupies a narrow band of irregular outline running mainly from east to west, there are islands, so to speak, of German-speaking population. The most important is that which includes the valley of the Valser Rhine, the Safienthal, and most of the valley of the Hinter Rhine. Although at present isolated from the compact German area, it will soon become a peninsula running out into the Romansh area, as it is only at present separated by a small district with mixed population to the north of Thusis. Dr. Menghius discusses in detail the present proportions of population within the Romansh area, pointing out those districts which are still almost unmixed, and those in which the neighbouring languages are making headway. In spite of local instances of falling back on the part of the German language, there is no doubt that it is now making rapid strides—a state of things helped, of course, by the opening of communications and the influx of German tourists, etc. In Italian Switzerland, including even the canton of Ticino, there are considerable percentages of Germans, though in that canton one commune only, that of Gurin, or Bosco, is almost entirely German. The German element even here is losing ground before the Italian, and must in time share the fate of other islands of German speech, which have become Italianized. The boundaries of the various linguistic areas are clearly shown on a map.

ASIA.

Captain Deasy in Central Asia.—The latest news received from Captain Deasy brings down our knowledge of his movements to the beginning of May last, at which date he was at Khotan. An attempt to penetrate to some of the ruins within the Takla Makan desert proved unsuccessful, owing to the ignorance of the guides, who professed to be acquainted with the position of the largest ruins, called Ak Tala Tuz. The start was made from Guma, on the route between Yarkand and Khotan, but on reaching a point in about 38° N. and 78° 27′ E., Captain Deasy was forced to turn back, the water-supply giving out on the last day but one. In the country north of Guma, the circular sandhills were covered with "jilgun," and surrounded by fairly high banks of sand, with sides almost vertical in the direction of the sandhills. They showed no one general direction, which seems to indicate that there are no prevailing winds. Trees were fairly common along the banks of a small nullah, which is said to contain water for a short time during the summer, but at the time of Captain Deasy's visit none was to be obtained, even by digging. A few tiny plants, with roots but a few inches in length, were occasionally found growing in sand, apparently quite dry, and too hot for several hours daily for a bare-footed native to stand upon. Captain Deasy had obtained good longitudes by chronometer between Yarkand and Khotan, that for the latter place (dependent on that of Yarkand) differing by about 4′ from that given on the Royal Geographical Society's map of Tibet. He hoped during the winter to go to Maralbashi, and, if possible, Aksu, to check the longitudes of those places. At Khotan a manufactory of fraudulent imitations of old manuscripts, coins, etc., was found to be carried on.

Extension of British Territory at Hongkong.—By a convention signed on June 9, the Chinese Government has leased to Great Britain for ninety-nine years certain territories on the mainland opposite Hongkong, which were needed both to assure the proper protection of the colony, and to provide room for commercial expansion, the island of Hongkong having proved too cramped an area for the requirements of its immense trade. The concession includes, as shown on the accompanying map (based on official information), the whole of the peninsula opposite Hongkong as far as a line joining Deep bay and Mirs bay, as well as the island of Lan-tao. The waters of both bays are included in the lease, but their northern shores are retained by China. The total area is about 200 square miles, all of which will be under British jurisdiction, except within the native city of Kau-lung. China reserves the right to use the leased waters for her own ships, whether belligerent or neutral.

Samarkand.—Most of the statistical committees of Russia publish every year their year-books (*Spravochnaya Knizhka*), which, besides various statistical and directory information, usually contain very valuable geographical and statistical materials. Most of these editions become, after a very few years, bibliographical rarities, which can only be obtained at the Imperial Library and at the Academy of Sciences at St. Petersburg. The fifth volume, for 1897, of the *Spravochnaya Knizhka* of the Samarkand province, edited by M. Virsky, secretary of the Local Statistical Committee, belongs to this category of useful publications. It contains a sketch of the wine industry and vine-growing, and of the cotton-growing in the province, by I. Slutskiy; a paper on the raw cotton industry and its relations to agriculture, by M. Virsky; on the cotton-cleaning works, by I. Slutskiy; and on various industries of the province, by N. Kirpichnikoff. We find next a description of the Yany-kurgan canton, its economical conditions and customs, by V. Nycrovetskiy; the crops in 1894 in parts of the Samarkand district, by M. Virskiy; on irrigation by the natives, by Petrovsky; on charitable institutions among the natives, by V. Nalivkin; on Samarkand legends, by V. Vyatkin; on the old Samarkand vilayet, and on the old graves in the province, by M. Virskiy and V. Chertoff; and the annals of the province for 1896.

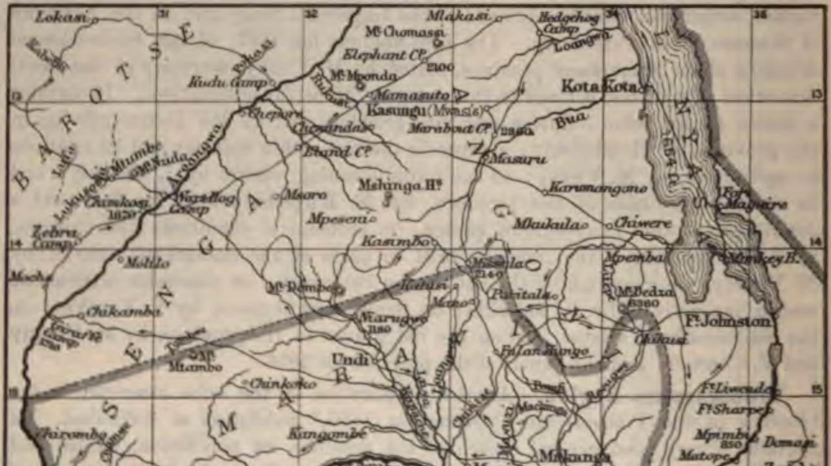
Transcaspian Region.—Another publication of the same character is the 'Review of the Transcaspian Province for 1893,' published at Askhabad. It contains a very good general sketch of the province, its population, settled and nomadic, irrigation, tree-plantations, mining, agriculture, trades, towns, means of communication, trade, education, and geographical exploration.

AFRICA.

The Geological History of Lake Tanganyika.—Mr. J. E. S. Moore has communicated to the Royal Society the preliminary results of his examination of the molluscs brought by him from Lake Tanganyika, in a paper published in the *Proceedings* of that body (vol. lxii. p. 451). Before considering the evidence as to the former history of the lake supplied by the morphological investigation of the organisms, he states the general results of his inquiry to have been—(1) The discovery of two entirely new generic forms in addition to the six genera of quasi-marine gasteropoda, the shells of which were previously known; (2) the proof that the invertebrate fauna includes a large number of widely separated animal types, all possessing the same quasi-marine affinities. Whereas the genera of molluscs which occur in the African fresh waters are very constant over an immense area (the whole Nyasan series has, *e.g.*, been recorded from the Victoria Nyanza), there is in Tanganyika a distinct fauna superadded to the normal African lake fauna as a whole. This strangely isolated group of organisms—which includes, besides the

Medusa and molluscs, two prawns, deep-water crabs, etc.—is designated by Mr. Moore *halolimnic.* None of these animals can be directly associated with any *living* oceanic species, so that the halolimnic fauna, wherever it came from, must be old. It is, besides, inconceivable that delicate organisms like the medusa should have found their way up the effluent as it now exists, while the molluscs are almost exclusively deep-water forms. The conclusion which might naturally be drawn from these facts, is entirely supported by the recent anatomical examination of the molluscs, which shows them to possess the characters of several modern marine types, and it must, therefore, be supposed that the Tanganyika region must, as suggested by Thomson, have once been in connection, either on the east, west, or north, with a deep arm of the sea. This is, of course, entirely opposed to the views, which have found favour in many quarters, of the permanence of African terrestrial conditions, but these, Mr. Moore considers, are at best based merely on the absence of definite facts of any kind relating to the past history of the interior.

M. Foa's Journey across Africa.—The account given by M. Foa in March last, before the Paris Geographical Society, is printed in the *Comptes Rendus* of that Society, No. 3, 1898. As his route led through no large area of previously unknown country, the additions which he has made to our knowledge of Central African geography are necessarily confined, in the main, to matters of detail, and these could, of course, not be entered into very fully within the limits of a lecture. Certain portions of his narrative however supply new information, and the ethnological facts, the collection of which was one of the primary objects of his mission, are of some interest. The first two years were spent in exploring the region between Lake Bangweolo, Lake Nyasa, and the Zambezi. This had been the scene of former journeys, the results of which have already been published by M. Foa, and he accordingly



George Philip & Son.

SKETCH-MAP ILLUSTRATING M. FOA'S JOURNEYS IN BRITISH CENTRAL AFRICA.

passes rapidly over this part of his explorations. He seems to have added somewhat to our knowledge of the Loangwa, or Aroangwa, as he prefers to call that important tributary of the Zambezi, and of the country to the north of the Zambezi, between Zumbo and Tete. His claim to be the first to survey the left bank of the Zambezi below Zumbo by land can hardly, however, be substantiated, as Drs. Livingstone and Kirk followed the same route along the north bank in 1860. M. Foa made an attempt to reach Bangweolo by a route not widely diverging from Thomson's, but was forced to turn back before reaching Chitambo by the swampy nature of the country. The last-named traveller in the dry season had found nothing but thin forest and grass. After carrying out some astronomical observations on Lake Nyasa, M. Foa started early in 1897 on the journey which finally took him across to the west coast. He deviated from the usual caravan route between Nyasa and Tanganyika in order to explore the headwaters of the Congo, tracing down the Chozi to its confluence with the Chambezi, but apparently not introducing any striking difference in their delineation on the map. The Awemba who inhabit this region will, M. Foa thinks, give the British authorities much trouble when an attempt is made to bring their country under control. After a voyage up Lake Tanganyika, which made a striking impression on the traveller, and of whose size he gives an exaggerated account, M. Foa made an attempt to penetrate Urua by a route between those of Thomson in the north, and Livingstone, Reichard, etc., in the south. But after a difficult march of 130 miles, which brought him to the sources of the Luizi, a tributary of the Lukuga, he found the country ahead in a state of revolt, and was obliged to return to Tanganyika, descending towards the Lukuga valley in the north. He was thus obliged to continue his journey by the well-known route through the Manyema country to Nyangwe, and down the Congo to its mouth. During his journey M. Foa took no less than eight hundred astronomical observations, which should prove a valuable aid towards the rectification of the map of the regions traversed.

M. Foa's Surveys.—The following is a *résumé* of the principal surveys executed by M. Foa during the years 1893–97. In 1893–94, the upper courses of the Revugwe, Mkombazi, and Nkondazi, between the Zambezi and Lake Nyasa, were explored; also portions of the Chiritse, Mavuzi, Loangwe, Luya, and Kapoche, as well as the mountainous districts containing their sources, and the north bank of the Zambezi between Kebra-basa and Zumbo. In 1895–96, various journeys were made in Angoniland and Mpeseni's country, including one from Missale to the Aroangwa river; a portion of the upper course of the latter being carefully mapped, while west of it M. Foa's itinerary reached to a point only a couple of days south of Lake Bangweolo. Additions were also made to our knowledge of Mwazi's and Chikuzi's countries, nearer Lake Nyasa, while detailed surveys were made of the Machinga mountains and the country along the Anglo-Portuguese boundary west of the Shire. In 1897, the position of the principal places on the west coast of Lake Nyasa were determined, the sources of the Aroangwa visited, and the hydrography of the principal streams flowing westward from the Nyasa-Tanganyika plateau elucidated, the courses of the Chozi and (in part) of the upper Chambezi being surveyed. Lake Tanganyika was circumnavigated, its shores being carefully examined and mapped, and soundings taken. In the attempt to penetrate Urua, the Mitumba mountains (4000 to 8000 feet) were climbed, and the Nyamba river visited; while, on the return to Tanganyika, the Lukuga was struck about three days from the lake. During the subsequent march to Nyangwe, the source of the Luama or Lugumba was visited, and its course rectified on the map, while observations, both for latitude and longitude, were made along the whole course of the Congo below Nyangwe. The instruments employed were the theodolite, sextant, two chronometers, boiling-point, and maximum and minimum thermometers, and mercurial barometer. Extensive ethnographical and natural history collections were made, and about five hundred photographs taken.

M. de Bonchamps' Expedition between Abyssinia and the Nile.—Although unsuccessful as regards its political object, this expedition seems to have added somewhat to our knowledge of the country about the headstreams of the Sobat, first explored by Captain Bòttego (*Revue Française*, August, 1898). Leaving Addis Ababa on May 17, 1897, M. de Bonchamps proceeded to Gore, beyond which the Abyssinian plateau falls towards the Baro, one of the branches of the Sobat. Failing to obtain help for his further journey he moved north-west to Bure, a commercial centre frequented by the blacks of the Sobat valley. Thence he sent two of his companions to reconnoitre a passage from the plateau to the plain of the Sobat, lying over 4000 feet below. They were, however, arrested on attempting to cross the frontier, and had to return to lay their complaint before Menelik. Rejoining M. de Bonchamps, they found that he had reorganized his expedition, incorporating the *personnel* of the party of Captain Clochette, who had lately died. The Baro was now reached without hindrance, and was crossed on a raft made of faggots. When full it has a current as impetuous as that of the Rhone. The Yamboe, a very black race, inhabit both banks. The expedition followed the left bank along a sort of natural dyke formed by its sediment, the country being inundated, so that the native huts are built on small eminences. Crossing two tributaries of the Baro, which rise in the Mocha plateau in the direction of Lake Rudolf, the expedition reached a wide marshy plain, completely uninhabited; and at length a swampy lake formed by the junction of the Baro with the Juba, partially explored by Bòttego. The latter was over 150 yards wide, and had a strong current and considerable depth. Boats being unobtainable, and the expedition in great straits, a return to the plateau was necessary. The Abyssinians had suffered severely from the climate of the lowlands. M. de Bonchamps was subsequently attacked by hæmaturic fever, and compelled to abandon his projects of further exploration.

Massacre of Captain Cazemajou's Expedition.—According to the news published by the *Politique Coloniale* (July 30 and 31), the French expedition to the southern borders of the Sahara, north of Sokoto, has met with a disaster, having been attacked by the natives of Zinder. Six Senegalese *tirailleurs* are reported killed, and grave fears are expressed as to the safety of Captain Cazemajou himself. The expedition was fitted out by the Comité de l'Afrique Française for the purpose of surveying the line from Say to Barrawa, and also of inquiring into the rumours regarding survivors of the Flatters mission, which had, in 1895, been set on foot by the ex-interpreter Jebari, who in that year published a work entitled 'Les Survivants de la Mission Flatters.' M. Cazemajou's report on the subject was published in the July number of the *Bulletin de l'Afrique Française*, his general conclusions being (1) that there were never any survivors of the Flatters mission either at Thaua or any other place in Adar; (2) that Jebari never reached Adar. He also examines various statements of Jebari in detail, finding many inaccuracies in them. Captain Cazemajou's expedition was expected to be rich in scientific, as well as political, results. In the latter direction, one of its objects was the establishment of friendly relations with Rabah in Bornu.

Formal Opening of the Congo Railway.—The ceremony of formally declaring the Congo railway open to traffic from Matadi to Stanley Pool took place during the first week in July. A large number of European visitors were present, including delegates from foreign governments. According to a communication from M. Tardieu, President of the Press Committee, published in the *Mouvement*

Géographique for July 17, the proceedings were carried through in four stages, the company traversing the line in four days, while fêtes were held at Boma, Matadi, Tumba, and Léopoldville. A banquet was held at the last-named place on July 6, at which M. Fuchs, the governor-general, formally declared the line open, Baron von Danckelmann afterwards expressing his congratulations on the great work accomplished in the name of the foreign delegates. As a result of the opening of the line, it is thought that the administrative centres, both of the State and the railway, will be shifted further from the coast. Either Léopoldville, or a position near the falls, will possibly take the place of Boma as capital.

Projected Balloon Voyage across the Sahara.—A project has been set on foot by Lieut. Hourst, the explorer of the Middle Niger, for the exploration of the Central Sahara by means of a balloon voyage. Accompanied by an aeronautic expert, M. Léo Dex, and by Captain Dides, M. Hourst proposes to start from the Gulf of Gabes, and hopes, by the aid of the north-east trade-wind, to be carried across the desert towards the Niger bend. The capacity of the balloon will be 13,000 cubic metres (450,000 cubic feet), and it is said that it will be able to remain aloft for forty to sixty days. A steel cable 4500 feet long will maintain connection with the surface of the earth, and might be utilized to give an electric shock to any natives who might attempt to stop the balloon. Preliminary trials with the latter will be made before the explorers set out.

Telegraph Line across the Congo State.—Among the schemes recently set on foot for the opening up of communications in Central Africa, that for a telegraph line across the whole breadth of the Congo State, from Boma to Lake Tanganyika, is certainly one of the most important. The *Mouvement Géographique* for July 31 gives some details regarding the scheme, which has been under consideration by the State authorities for some years. A beginning has already been made by the construction of a line towards Stanley Pool, now almost completed, while work has also been begun between the Pool and Kwa-mouth. Three million francs have lately been voted for the prosecution of the enterprise, and it has been decided to commence work also from the east, for which purpose an expedition has been organized on a large scale, and was to leave Brussels on August 20. Its leader is Mr. Mohun, formerly United States Consul on the Congo, who accompanied Captain Hinde in his exploration of the Lualaba above Nyangwe, and he will be supported by nine Europeans, including Mr. Thornton, an experienced engineer, who has assisted in telegraph construction in India, Australia, and South Africa. The expedition will proceed to Tanganyika by the Nyasa route. In its central part, the projected line will follow the great bend of the Congo.

AMERICA.

Dr. Steffen's Expedition.—The seventh number of *Petermanns Mitteilungen* also contains information as to Dr. Steffen's movements. Accompanied by Lehrer Krautmacher and a Chilian geographer named Sands, he entered the Poyehuapi fiord in about 44° 30′ S., discovering a large hitherto unknown river, up which he pushed his way. In addition to difficulties from rapids, excessive rain much hindered his progress. On March 12 he was on the Rio Cisne of Simpson, and had before him a cleft in the mountains, through which he hoped to penetrate to the Patagonian plateau. He had been unable to find the Lago La Plata, shown on Argentine maps as less than 20 miles from the Chilian coast, its supposed place being occupied by a high mountain. Presumably, it lies further east. Some fears have been entertained as to the safety of Dr. Steffen, but the latest news reported his safe arrival at Lake Nahuel-huapi.

AUSTRALASIA AND OCEANIC ISLANDS.

Sir W. MacGregor's Explorations on the North Coast of New Guinea.—In a report, dated July 1, 1897, Sir W. Macgregor gives an account of his proceedings earlier in the year in the neighbourhood of the Mambare. Some new geographical work was accomplished by the ascent of the stream which enters the sea just within German territory. It has before been known as the Ikore, but its correct name proved to be the Gira. Its mouth has a bar which cannot be passed when there is much wind, or a swell from the south-east. At less than a mile from this the river is within British territory, but a loop higher up is again on the German side of 80° S. lat. The highest point visited was some 15 geographical miles inside the British colony, the stream coming from the south-west, chiefly from Mount Albert Edward. The country on its banks was inviting, with many villages and gardens. The staple food is *taro*. Trials revealed the presence of gold in the river-shingle in a greater degree than has been noticed in any of the other streams—a fact easily accounted for by the origin of the Gira in Mount Albert Edward. Before turning, rapids were encountered, the river being bounded by exceedingly steep sandstone hills, covered by forest trees. Sir W. MacGregor suggests that, in order to utilize it for commercial or travelling purposes, the river should be made free to both the German and the British colonies.

Explorations in the Owen Stanley Range.—The *Bollettino* of the Italian Geographical Society for July contains the account of an expedition across the Owen Stanley range by Signor A. Giulianetti, which adds considerably to our knowledge of its geography. The writer was, early in 1897, commissioned by Sir W. MacGregor to establish a dry-weather station on Mount Scratchley or the Wharton range, chiefly, it seems, for the purpose of collecting natural history specimens. His route led up the valley of the Vanapa from the south coast, but, instead of continuing eastward to the neighbourhood of Mount Victoria, struck more to the north in the direction of Mount Thynne, whence a ridge was found to continue without interruption to the Wharton range, north-east of Mount Scratchley. Here a station was formed at an elevation of 11,000 feet, the climate being found to be extremely healthy. Both the geological formation and the fauna and flora were found to be practically the same as on Mount Scratchley, where collections had been made in the preceding year, so that comparatively few novelties presented themselves. The temperature rarely rose above 60° Fahr. in the middle of the day, while at 7 a.m. it would fall as low as 36°, or even to freezing. The prevailing winds were from the north-east and south-west, and rain fell in large quantities, only twenty days being dry during the stay on the range. Frequent visits were made to the station by natives from both sides of the watershed, which communicate by three paths across the range. Another path is said to exist to the east of Mount Victoria. An attempt to push northward to Mount Albert Edward failed on account of the dense vegetation and the broken nature of the ridge. Thick mist also increased the difficulties. From the last camp a view was obtained of some huge mountains towards the north, between Mounts Albert Edward and Yule. Signor Giulianetti has discovered that the principal branch of the Vanapa does not come from Mount Victoria, but from the north, from the Wharton range and Mount Albert Edward. It therefore breaks through the range, hitherto shown on our maps as extending west of Mount Thynne. Its upper valley is densely inhabited, and has an excellent climate, recalling that of Europe. The natives are robust and well disposed, and possess large food-supplies. This neighbourhood would form an excellent station for a naturalist. Sir W. MacGregor visited the station on the Wharton range in October last, taking a fair number of theodolite observations.

The Central Australian Deserts.—A careful study of the deserts of Central Australia, their characteristics and causes, on similar lines to that carried out by Dr. Schirmer for the Sahara, has lately been contributed by M. G. Lespagnol to the *Annales de Géographie* (Nos. 31–33, 1898). It is based on a thorough examination of all the available authorities, copious references to whose works are given in footnotes. M. Lespagnol divides the subject into three parts—(1) the relief and other characteristics of the surface; (2) the climate; and (3) the hydrographic features of the region. In the first section, he points out the general uniformity of the surface owing to the slight disturbances of the crust in recent geological times, and the fact that the one important mountain system of Australia is eccentric. He also traces the denuding agents at work, and the peculiar character of the surface features to which they give rise. The second section is perhaps the most important, as presenting a study of the causes to which the desert character of Central Australia is due. These he shows to be extremely complex, and to interact in a striking way on each other, so that it is impossible to single out any one as the primary cause. At the outset he lays stress on the disturbance introduced into the regular *régime* of atmospheric phenomena by the existence of extensive land masses. The extremes of temperature characteristic of a continental climate are very pronounced in Central Australia, and react in turn on the direction of the winds. The prevalence of high pressure in winter and low pressure during summer brings about a system of outflowing or inflowing air-currents, and while the former are necessarily dry, the latter do not bring the humidity which might be looked for, owing to the predominance of the dry descending winds from the south-east over these from other directions, and to such topographic and structural causes as the absence of interior relief, the presence of depressions, permeable strata, and so forth. The author discusses the amount of rainfall, and concludes that Central Australia receives more than the Sahara, but less than the Kalahari; it may therefore be said to present a medium desert character. His explanation of the causes of the Australian desert is the exact counterpart of that given by M. Schirmer for the Sahara, though he does not dwell upon their similarity. Nor does he enter into the question why these regions are more exposed to desert-forming conditions than other land masses within the same latitudes. In the third section he gives a clear description of the hydrographic features of Central Australia, dealing successively with permanent running-water creeks, evaporation-basins, and subterranean waters.

POLAR REGIONS.

The Belgian Antarctic Expedition.—Grave fears have been expressed in some quarters as to the fate of Lieut. de Gerlache's expedition, which sailed for the Antarctic in August, 1897. The ship was last heard of from the straits of Magellan, whence conflicting rumours of disaster reached Europe early this summer. According to the original programme, the *Belgica* was to proceed to the neighbourhood of Graham's land, and thence eastward, arriving in Melbourne in April last. We learn, however, from Colonel de Gerlache, father of the commander of the expedition, that circumstances are known to have caused an alteration in the plans, and as the ship was fully provided for wintering, having provisions for three years on board, it may be hoped that the fears which have been expressed may be groundless.

GENERAL.

Monument to Francis Garnier.—A monument raised by public subscription to the memory of the great explorer of Indo-China, was unveiled in Paris on July

14 last, by M. Trouillot, French colonial minister. Among those present at the ceremony were M. Milne-Edwards, president of the Paris Geographical Society, who made over the monument to the city of Paris in the name of the committee by which the arrangements were carried out; Prince Roland Bonaparte; M. J. Dupuis, himself well known as an explorer in Indo-China; and others interested in French colonial expansion. M. Milne-Edwards stated that subscriptions had come in, not only from all parts of France, but even from remote villages in Cochin-China, where the memory of Garnier was revered; other speeches were made, pointing out the potent influence exercised by the deceased traveller on the fortunes of France in Asia. The statue, the work of a well-known sculptor, is said to be a successful one. It occupies a position in the Place de l'Observatoire.

Russian Geographical Bibliography.—Geographers will be glad to learn that the Russian Geographical Society now gives in its *Izvestia* a full bibliography of all that enters its library, on exactly the same plan as the bibliography in this *Journal*.

A University Degree in Geography.—Mr. A. J. Herbertson, lecturer on geography in the Heriot-Watt College, Edinburgh, whose report on geographical education to the British Association has recently been referred to in these pages, has obtained the degree of Ph.D., *multa cum laude*, in geography, at the University of Freiburg in Baden. Dr. Herbertson's thesis was on the "Distribution of Rainfall over the Earth's Surface," a subject which he has thoroughly investigated while compiling the rainfall maps for the great physical atlas about to be published by Mr. Bartholomew.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps. **Ball—Coolidge.**

The Alpine Guide. The Western Alps. By the late John Ball, F.R.S., etc. A New Edition reconstructed and revised on behalf of the Alpine Club by W. A. B. Coolidge. With New and Revised Maps. London: Longmans & Co., 1898. Size 7½ × 5½, pp. l. and 612. *Price* 12*s.* *Presented by the Publishers.*

This minute and careful guide to mountaineers in the Western Alps is accompanied by a bibliography of the region in question, a list of Alpine publications, of maps, and a series of new maps specially prepared.

Leland Stanford Jr.
UNIVERSITY

Jr.
SITY

Austrian Alps. ——

Sechster Jahres-Bericht des Sonnblick-Vereines für das Jahr 1898. Wien, 1898. Size 11½ × 8, pp. 38. *Plates. Presented by the Sonnblich Verein.*

Report of the society which maintains the highest meteorological station in Europe.

Austrian Alps. **Penck.**

Oberlercher's Glocknerrelief. Von Prof. Dr. Albrecht Penck. Wien, 1896. Size 7½ × 4½, pp. 12. *Presented by the Author.*

An account of Herr Oberlercher's model of the Gross Glockner, which will be specially noticed.

Austria—Istria. **Martel.**

Sur la Foiba de Pisino (Istrie). Par M. E. A. Martel. (From the *Comptes Rendus* of the Academy of Sciences, 1896.) Size 11 × 9, pp. 4. *Presented by the Author.*

France. *B.S.G. Com. Bordeaux* **21** (1898): 213–217. **Duffart.**

La magnétite des dunes de Gascogne. Par Charles Duffart.

Arguments designed to show that the region of the *landes* is, from the geological point of view, to be referred to the Quaternary alluvium.

France. **Baedeker.**

South-Eastern France, including Corsica. Handbook for Travellers. By Karl Baedeker. Third Edition. With 15 Maps, 14 Plans, and a Panorama. Leipsic: Karl Baedeker. London: Dulau & Co., 1898. Size 6½ × 4½, pp. xxiv. and 322. *Presented by Messrs. Dulau & Co.*

France—Aveyron. **Durand and Laponge.**

B.S. Languedoc. G. **20** (1897): 285–315, 461–476.

Matériaux pour l'Anthropologie de l'Aveyron. Par le Dr. Durand (de Gros) et G. de Laponge. *With Map.*

The map shows the average cephalic index in each canton of the department.

France—Chamonix. **Whymper.**

Chamonix and the Range of Mont Blanc. A Guide by Edward Whymper. Third Edition. London: John Murray, 1898. Size 7½ × 5, pp. xiv. and 206. *Maps and Illustrations. Price 3s. Presented by the Author.*

This valuable guidebook has been revised and brought up to date very thoroughly.

France—Mont-Blanc. *B.S. Topographie France* **21** (1897): 86–96, 136–143. **Guyot.**

Carte du Massif du Mont-Blanc au 20,000ᵉ. Par M. le Capitaine Guyot.

An account of the method of surveying, trigonometrical and photographic, adopted in the preparation of the map.

France—Seine. **Lemoine and Babinet.**

Ponts et Chaussées. Service hydrométrique du Bassin de la Seine. Observations sur les Cours d'Eau et la Pluie centralisées pendant l'année 1896. . . . Par M. G. Lemoine et M. Babinet. Versailles. Size 17 × 11. *Diagrams.*

Résumé des observations centralisées par le Service hydrométrique du Bassin de la Seine pendant l'année 1896. Par M. Babinet. Versailles, 1897. Size 11 × 7, pp. 56.

Germany—Alsace. **Reuss.**

L'Alsace au dix-septième siècle au point de vue géographique, historique, administratif, économique social, intellectuel et religieux. Par Rodolphe Reuss. Tome Premier. Paris: E. Bouillon, 1897. Size 10 × 6½, pp. xxxvi. and 736.

Germany—Eifel. *Meteorolog. Z.* **15** (1898): 169-174. **Polis.**

Beiträge zur Kenntniss der Niederschlagsverhältnisse der Eifel. Von P. Polis. *With Map and Diagram.*

Greece. **Buondelmonti.**

Publications de l'École des Langues Orientales vivantes. Quatrième Série—Tome xiv. Description des Iles de l'Archipel. Par Christophe Buondelmonti. Version Grecque par un anonyme. Publiée d'après le Manuscrit du Sérail, avec une Traduction Française et un Commentaire. Par Émile Legrand. Première partie. Paris: E. Leroux, 1897. Size 11 × 7½, pp. xl. and 258. *Maps.*

Greece—Photographs. **Philippson.**

Sammlung von Photographien aus Griechenland. Aufgenommen von Dr. Alfred Philippson. Size 9 × 6, pp. 16. *Presented by the Author.*

A catalogue of the geographical photographs taken by Dr. Philippson in Greece, copies of which he is desirous of exchanging for other photographs of geographical or geological interest.

Mediterranean—Cyprus. **Deschamps.**

Cosmos **12** (1894–96): 1–14, 90–94, 109–128, 184–211.

L'Isola di Cipro. Viaggi e studi di Emilio Deschamps. *With Illustrations.*

Norway—Lofoten Islands. *Alpine J.* **19** (1898): 135–148. **Priestman.**

Lofoten, 1898. By Howard Priestman. *With Illustration.*

Russia. *P.A. Nat. Sci. Philadelphia* (1897): 405–457. **Frazer.**

Geological Section from Moscow to Siberia and return. By Dr. Persifor Frazer.

Russia—Crimea. **Bogoslowsky.**

Quelques observations sur les sols de la Crimée. Par N. Bogoslowsky. [In Russian, *resumé* in French.] Size 9½ × 6½, pp. [12]. *Presented by the Author.*

Russia—Finland. ——

Observations météorologiques publiées par l'Institut Météorologique Central de la Société des Sciences de Finlande. Résumé des années 1881–1890. Kuopio: O. W. Backman, 1897. Size 15 × 10, pp. 28.

Russia—Finland. ——

Observations publiées par l'Institut Météorologique Central de la Société des Sciences de Finlande. Volume Quinzième. Première Livraison. Observations météorologiques faites à Helsingfors en 1896. Helsingfors, 1897. Size 14 × 10, pp. 122.

Sweden. ——

A Trip to Sweden, the Land of the Midnight Sun. By the Thule S.S. Co., Limited, Gothenburg, 1898. Size 5½ × 8, pp. 62. *Illustrations.*

Sweden. ——

The Swedish Touring Club's Guide to Sweden. With 15 Maps and 6 Plans. London: G. Philip & Son, 1898. Size 7 × 5, pp. xlii. and 244. *Price* 5*s.* *Presented by the Publishers.*

This Guide is interesting as the work of the Swedish Touring Club, edited by Dr. Gunnar Andersson and Dr. Mauritz Boheman, the routes written by Mr. Axel Ramm, and the whole translated by Mr. W. E. Harlock and printed in Stockholm. The work is well arranged, and the maps are clear and serviceable.

Switzerland—Zermatt. **Whymper.**

The Valley of Zermatt and the Matterhorn. A Guide, by Edward Whymper. Second Edition. London: John Murray, 1898. Size 7½ × 5, pp. xiv. and 224. *Maps and Illustrations. Price* 3*s.* *Presented by the Author.*

The new edition is brought up to the beginning of the present tourist season.

United Kingdom—England. *J. Scottish Meteorolog. S.* **11** (1898): 58–64. **Mossman.**

The Aurora Borealis in London from 1707 to 1895. By R. C. Mossman.

An addition to Mr. Mossman's study of the meteorology of London. The appearance of the aurora is most frequent in October and April, and least so in December and June.

United Kingdom—England. **Creighton.**

The Story of some English Shires. By the Right Honourable and Right Reverend Mandell Creighton, D.D., Lord Bishop of London. London: the Religious Tract Society, 1897. Size 12 × 9½, pp. 312. *Illustrations. Price* 35*s.*

A republication of a series of articles originally written for the *Leisure Hour*, and giving the author's impression of the distinctive characteristics of the following counties: Northumberland, Durham, Yorkshire, Cumberland, Westmoreland, Lancashire, Cheshire, Shropshire, Stafford, Derby, Worcester, Gloucester, Hereford, Warwick, Leicester, Northampton, and Huntingdon. The illustrations are woodcuts by Whymper.

United Kingdom—England. **Inglis.**

The 'Contour' Road Book of England (South-East Division). A Series of Elevation Plans of the Roads, with Measurements and Descriptive Letterpress. By

Harry R. G. Inglis. With 500 Diagrams and Maps. London: Gall and Inglis, 1898. Size 6¾ × 4, pp. xx., [288], and 16. *Price* 2*s*. *Presented by the Publishers.*

This fresh instalment of an extremely practical road-book is, like the rest of the series, no mere literary or theoretical compilation, but is checked throughout by the actual experience of Mr. Inglis in cycling over the country.

United Kingdom—Gazetteer. **Cassell.**

Cassell's Gazetteer of Great Britain and Ireland; being a Complete Topographical Dictionary of the United Kingdom. With numerous Illustrations and Sixty Maps. [Vol. v.] Newchurch—Somersetshire. London: Cassell & Co., 1897. Size 10½ × 7½, pp. vi. and 472. *Presented by the Publishers.*

This valuable gazetteer maintains the excellence which has all along characterized the letterpress and illustrations. The map of Scotland in sections issued in the new volume is not of the same quality.

United Kingdom—Meteorology. *J. Scottish Meteorolog. S.* **11** (1898): 3–41*b*. **Buchan.**

The Mean Atmospheric Pressure and Temperature of the British Islands. By Dr. Buchan. *With Maps.*

This important paper will be specially noticed.

United Kingdom—Scotland. *J. School G.* **2** (1898): 161–170. **Herbertson.**

The Geography of Scotland (I.). By A. J. Herbertson.

On the Highlands of Scotland.

ASIA.

Asia Minor—Yezids. *Scottish G. Mag.* **14** (1898): 295–307. **Dingelstedt.**

The Yezids. By Victor Dingelstedt. *With Map.*

On the Yezid Kurds, with a map showing the distribution in Asia Minor of the several Kurdish tribes.

Central Asia. *Iz. Imp. Russ. G.S.* **34** (1898): 1–59. **Roborovsky.**

Roborovsky, V.I. Preliminary Report on the Expedition to Central Asia, 1893–95. [In Russian.]

China. ———

Prospectus of United States Commercial Commission to China. Under the direction of the Philadelphia Commercial Museum. Size 9½ × 6, pp. 12. *Presented by Gustave Niederlein.*

Plan of a proposed visit to China for the investigation of the actual commercial condition of that country, especially in connection with American trade.

China. *J.R. Colonial I.* **29** (1898): 487–491. **Wenyon.**

The Trade Routes of South China and their Relation to the Development of Hong Kong. By W. F. Wenyon. [Abstract.]

China—Manchuria. *Oesterreichische Monats. Orient.* **24** (1898): 49–53. ———

Die chinesische Ostbahn und ihr Gebiet.

The Eastern Railway of China is the official name of the Russian railway through Manchuria.

China—Ssu-ch'uan. **Litton.**

Report of a Journey to North Ssu-ch'uan. Foreign Office. No. 457, Miscellaneous. 1898. Size 10 × 6½, pp. 48. *Maps. Price* 8½*d.*

A notice of this important journey appears in the *Journal* for August, p. 187.

China—Suchou. *L'Esplorazione Com.* **13** (1898): 144–155. **Nocentini**

La Città di Succiu e la sua industria serica. Per L. Nocentini.

Chinese Empire. **Wellby.**

Through Unknown Tibet. By Captain M. S. Wellby. London: T. Fisher Unwin, 1898. Size 9½ × 6½, pp. xiv. and 440. *Portraits, Maps, and Illustrations. Price* 21*s*. *Presented by the Publisher.*

This handsome volume gives a plain straightforward narrative of the journey of Captain Wellby and Lieut. Malcolm across Tibet and Northern China, an account of the geographical results of which was communicated to the Society, and will appear in the *Journal*. This volume is well illustrated, and has a series of maps of the route on the large scale of 16 miles to an inch.

Chinese Turkestan. *Izvestiya Imp. Russ. G.S.* **34** (1898): 60–116. **Kozloff.**
Kozloff, P.K. Lob-Nor. [In Russian.] *With Maps.*

This has been noticed in the *Journal* for June, vol. xi. p. 652.

French Indo-China. *B. Union G. Nord de la France* **18** (1897): 193–223. **Lemire.**
Les Arts et les Cultes anciens et modernes en Annam-Tonkin. Par M. Ch. Lemire. *With Map and Illustrations.*

The map is a rough sketch of the ethnography of Indo-China.

French Indo-China—Cambodia. *Tour du Monde* **4** (1898): 289–300. **Agostini.**
Pnom-Penh (Voyage au Cambodge). Par M. J. Agostini. *With Illustrations.*

French Indo-China—Annam. *B.S.G. Com. Paris* **20** (1898): 170–188. **Paris.**
De la colonisation agricole en Annam. Par M. Camille Paris.

The author has lived for seventeen years as a colonist in Annam.

French Indo-China—Mekong. *B.S.G. Com. Paris* **20** (1898): 138–146. **Simon.**
De l'utilisation économique du Mékong de Janvier 1896 à Janvier 1898. Par M. le lieutenant G. Simon.

On the service of French Government steamers on the upper Mekong river.

India and Ceylon. *Imp. I.J.* **4** (1898): 174–175. **Ferguson and Davis-Allen.**
The projected Indo-Ceylon Railway, its strategic and commercial aspects and Imperial importance. By John Ferguson and J. Davis-Allen.

On a proposed railway by way of Adam's Bridge.

Indo-China. *C.Rd. S.G. Paris* (1898): 162–171. **Massieu.**
De l'Irrawaddi au Mékong supérieur. Par Mme. Massieu. *With Map and Illustrations.*

Notes of a solitary journey performed by Mme. Massieu up the Mekong and across into Burma, as an incident in a journey through and round Asia, which she crossed by the Siberian railway.

Japan. *Rev. Scientifique* **9** (1898): 720–722. **Vacher.**
Statistique du Japon. Par M. L. Vacher.

Japan—Formosa. **Pickering.**
Pioneering in Formosa. Recollections of Adventures among Mandarins, Wreckers, and Head-Hunting Savages. By W. A. Pickering, C.M.G. With an Appendix on British Policy and Interests in China and the Far East and Twenty-five Illustrations from Photographs and Sketches by the Author. London: Hurst & Blackett, 1898. Size 9½ × 6½, pp. xvi. and 284. *Portrait. Price* 16*s*. *Presented by the Publishers.*

Autobiographical reminiscences of the author's long career in China and Formosa, where he served in the Chinese Maritime Customs. Many striking adventures with the natives of Formosa are related, and the book forms a contribution to the history of European intercourse with the people of the Far East.

Malay Archipelago—Celebes. **Eerdmans and Erkelens.**
Het Landschap Gowa, door A. J. A. F. Eerdmans. En Geschiedenis van het Rijk Gowa, door B. Erkelens. Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen. Deel L. 3e Stuk. Batavia: Albrecht & Co., 1897. Size 11½ × 8, pp. 122. *Plate.*

Russia—Siberia. **Jochelsson.**
Iz. E. Siberian Sect., Imp. Russian G.S. **29** (1898): 48–52.
W. Jochelsson. Vorläufiger Bericht über ethnographische Forschungen unter der Völkerschaften der Bezirke von Kolymsk und Werchojansk der Provinz Jakutsk. *With Map.*

Russia—Siberia. *B.S.G. Com. Paris* **20** (1898): 154–163. **Legras.**
La Sibérie économique en 1898. Par M. Jules Legras.

The author visited Siberia in 1896 and 1897, and on this basis considers the present economic condition of the country.

Turkey—Palestine. *P.R.I.* **15** (1898): 346–349. **Conder.**
Palestine Exploration. By Lieut.-Colonel C. R. Conder.

AFRICA.

Algeria. *C. Rd.* **126** (1898): 1589–1592. **Rolland.**
Régime du bassin artésien de l'Oued Rir' (Sud algérien) et moyens de mieux utiliser ses eaux d'irrigation. Note de M. Georges Rolland.

British Central Africa. *J.R. Colonial I.* **29** (1898): 467–486. **Gibbons.**
Marotseland and the Tribes of the Upper Zambezi. By Major A. St. H. Gibbons.

British West Africa—Benin. **Auchterlonie and Pinnock.**
T. Liverpool G.S. (1898): 5–16.
The City of Benin: the Country, Customs, and Inhabitants. By Messrs. T. B. Auchterlonie and James Pinnock.

Congo Free State. *Mouvement G.* **15** (1898): 175–186. **Wauters.**
La locomotive au Stanley-Pool. Le chemin de fer du Congo. Historique (1878–1898). Par A. J. Wauters. *With Maps, Portraits, etc.*

Account of the completion of the railway from Matadi to Stanley Pool, with a map of the route.

East Africa. *Globus* **73** (1898): 297–303. **Cavendish.**
Cavendishs Reise durch Ostafrika. *With Portrait, Maps, and Illustrations.*

East Africa—Somaliland. **Ghika.**
Prince Nicolas D. Ghika. Cinq Mois au Pays des Somalis. Genève et Bale, Georg & Co., 1898. Size 11 × 7½, pp. vi. and 224. *Portraits, Map, and Illustrations. Price* 12*s.*

This will be noticed along with other books on Africa.

Egypt. *Sitz. k. P.A. W. Berlin* (1898): 291–303. **Borchardt.**
Bericht über die Corrosion des Sandsteinmaterials der Tempelbauten auf Philae. Von Dr. L. Borchardt. *With Plan and Illustrations.*

On the erosion wrought by desert sand, driven by the wind, on the temples at Philae.

Egypt. **Steevens.**
Egypt in 1898. By G. W. Steevens. London: W. Blackwood & Sons, 1898. Size 8 × 5½, pp. x. and 284. *Illustrations. Price* 6*s. Presented by the Publishers.*

The diary of a recent visit to Egypt, including a journey up the Nile, written with a descriptive force quite unusual in books of holiday travel.

Egypt—Nile. *Globus* **73** (1898): 323–325. **Zimmermann.**
Das Staubecken des Nil bei Assuan. Von Dr. Albert Zimmermann. *With Map.*

On the irrigation reservoir now being established on the Nile at Assuan.

French West Africa. *B.S.G. de l'Est* (1897): 349–366. **Vermeersch.**
Historique de la mission Band-Vermeersch. *With Map.*

Full account of the Vermeersch expedition from Dahomey to the Niger.

German East Africa. *M. Deutsch. Schutzgeb.* **11** (1898): 171–172. **Johannes.**
Geographische Angaben aus Ostafrika. Von Hauptmann Johannes. *With Map.*

German East Africa. *Blackwood's Mag.* **163** (1898): 788–795. **Witt.**
An Experiment in Colonisation. By Robert C. Witt.

A fascinating description of Dar-es-Salaam. The author gives his opinions of the good and bad points of German colonisation.

German West Africa—Kamerun. **Stein and Geyger.**
M. Deutsch. Schutzgeb. **11** (1898): 168–170.
Aufnahmen des Premierlieutenants Freiherrn v. Stein zu Lausnitz und des Gouvernements-Sekretärs Geyger zwischen Kamerun und Sanaga (Lom).

German West Africa—Kamerun. *M. Deutsch. Schutzgeb.* **11** (1898): 162–167. **Stein.**
Die Anlage eines Weges zwischen Kamerun und Edea. Von Premierlieutenant Freiherrn v. Stein. *With Map.*

German West Africa—Togo. *M. Deutsch. Schutzgeb.* **11** (1898): 89–161. **Zech.**
Vermischte Notizen über Togo und das Togohinterland. Von Premierlieutenant Graf. v. Zech. *With Illustrations.*

Madagascar—Tamatave. *B.S.G. de l'Est* (1897): 367–396. **Courtet.**
Notes sur Tamatave. Par E. Courtet. *With Map and Plates.*

North Africa. **Bernard.**

Revue Bibliographique des travaux sur la géographie de l'Afrique Septentrionale. Par Augustin Bernard. Extrait du Bulletin de la Société de Géographie d'Alger. Alger: S. Léon, 1898. Size 10 × 6½, pp. 24. *Presented by the Author.*

A summary of the contributions to the literature concerning Marocco, Algeria, Tunis, and the Western Sahara during the year 1897.

South Africa. **Bertrand.**

Alfred Bertrand. Au Pays des Ba-Rotsi, Haut-Zambèze. Voyage d'exploration en Afrique et retour par les chutes Victoria, le Matebéléland, le Transvaal, Natal, le Cap. Paris: Hachette et Cie., 1898. Size 11½ × 8, pp. 332. *Portrait, Maps, and Illustrations. Presented by the Author.*

This will be referred to along with other recent books on Africa.

South-East Africa. *B.S. Neuchateloise G.* **10** (1898): 5–500. **Junod.**

Les Ba-Ronga. Étude ethnographique sur les indigènes de la Baie de Delagoa. Mœurs.—Droit Coutumier.—Vie nationale.—Industrie.—Traditions.—Superstitions et Religion. Par Henri A. Junod. *With Map and Illustrations.*

Tunis. **Johnston.**

A Journey through the Tunisian Sahara. By Sir Harry H. Johnston, K.C.B. From the *Geographical Journal* for June, 1898. Size 10 × 6½, pp. 28. *Map and Illustrations.*

Tunis—Bizerta. **[Ludwig Salvator.]**

Benzert. Prag: H. Mercy, 1897. Size 12½ × 9½, pp. xii. and 70. *Map and Illustration. Presented by H.I.H. The Archduke Ludwig-Salvator.*

A description of Bizerta, with a map and a number of full-page reproductions of the Archduke Ludwig Salvator's pen-and-ink drawings.

West Africa *B.S.G. Com. Paris* **20** (1898): 147–153. **Vermeersch.**

Au Pays des Baribas. Par le Capitaine Vermeersch. *With Map.*

West Africa. *C. Rd. S.G. Paris*: (1898): 171–182. **Vermeersch.**

Au Gourma et au pays des Baribas. Par Capitaine L. Vermeersch. *With Map.*

West Africa. *T. Liverpool G.S.* (1898): 58–73. **Kingsley.**

West Africa, from an Ethnologist's Point of View. By Miss M. H. Kingsley.

NORTH AMERICA.

Alaska—Mount St. Elias. *Alpine J.* **19** (1898): 116–128. **Filippi.**

The Expedition of H.R.H. the Prince Louis of Savoy, Duke of the Abruzzi, to Mount St. Elias (Alaska). By Dr. Filippo de Filippi. *With Map and Illustrations.*

Alaska and Yukon. **Secretan.**

To Klondyke and Back. A Journey down the Yukon from its source to its mouth. By J. H. E. Secretan. With Hints to Intending Prospectors, and Twenty-four Illustrations. London: Hurst and Blackett, 1898. Size 8½ × 5½, pp. xii. and 260. *Price 6s. Presented by the Publisher.*

Although written with an effort to be humorous, there is no reason to doubt the substantial accuracy of the description of a journey from Victoria, B.C., to Juneau by sea, and thence over the Chilcoot pass and down the Yukon to Klondike, and returning down the Yukon to the sea.

Canada—Western Goldfields. *J.S. Arts* **46** (1898): 649–661. **Merritt.**

The Goldfields of British Columbia and the Klondike. By W. Hamilton Merritt.

Canada—Rocky Mountains. *Alpine J.* **19** (1898): 97–112. **Dixon.**

The Ascent of Mount Lefroy, and other Climbs in the Rocky Mountains. By Harold B. Dixon. *With Illustrations.*

United States. ———

Annual Reports of the War Department for the Fiscal Year ended June 30, 1897. Report of the Chief of Engineers. 6 Parts. Washington, 1897. Size 9½ × 6, pp. 4226. *Maps and Diagrams. Presented by the Engineer Department, U.S. Army.*

This comprehensive report contains the usual mass of exact information regarding the engineering works on rivers and harbours in all parts of the United States.

United States. **Gannett.**

Stanford's Compendium of Geography and Travel (New Issue), North America. Vol. ii. The United States. By Henry Gannett. London: E. Stanford, 1898. Size 8 × 5¼, pp. xvi. and 466. *Maps and Illustrations. Price* 15*s*. *Presented by the Publisher.*

This will be specially noticed.

United States—Florida. **Ladureau.**

A travers le Monde, Tour du Monde **4** (1898): 177–180.

La Floride. Par A. Ladureau. *With Illustrations.*

The author has resided for many years in Florida.

United States—Indiana. *J. Geology* **6** (1898): 257-272. **Veatch.**

Notes on the Ohio Valley in Southern Indiana. By Arthur C. Veatch. *With Maps and Sections.*

United States—Indian Territory. **Drake.**

P. American Philosoph. S. **36** (1897): 326-419.

A Geological Reconnaissance of the Coal Fields of the Indian Territory. By Noah Fields Drake. *With Maps and Illustrations.*

United States—Maryland. **Clark.**

Maryland Geological Survey. Volume One. Baltimore: The Johns Hopkins Press, 1897. Size 10½ × 7, pp. 540. *Maps, Diagrams, and Illustrations. Presented by the Survey.*

The Geological Survey of the State of Maryland was established in 1896 under the joint auspices of the State Government and the Johns Hopkins University, and under the executive charge of Prof. W. Bullock Clark. The volume just published includes an introductory notice of the organization and scope of the Survey, a historical sketch of the study of the natural features of Maryland, a complete report of the present state of knowledge concerning the geology and physical geography of the State, with bibliographies, and a Report on Magnetic work in Maryland, by L. A. Bauer. The book is finely illustrated, and makes a substantial addition to the most valuable division of geographical literature.

United States—Mississippi. *J. Geology* **6** (1898): 273-302. **Mabry.**

The Brown or Yellow Loam of North Mississippi, and its relation to the Northern Drift. By T. O. Mabry. *With Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine and Chile—Boundary. **Hansen.**

The Argentino-Chilian Boundary Question. By F. P. Hansen. Liverpool: C. Tinling & Co., 1898. Size 10 × 6¼, pp. 12. *Presented by the Author.*

A brief summary of the history and the present position of the boundary question in the Andes region between the Argentine Republic and Chile.

Brazil—Maranhão. *Rev. Trim. I.G. e Hist. Bahia* **4** (1897): 520–527. **Marques.**

O Padre A. Vieira. Noticias particulares em Maranhão. Pelo Dr. Cesar Augusto Marques.

Cuba. *National G. Mag.* **9** (1898): 193-242. **Hill.**

Cuba. By Robert T. Hill. *With Maps and Illustrations.*

A model geographical monograph, with regard to the solid basis of physical geography, history, and economic conditions. The illustrations include maps, diagrams, and carefully selected views.

Cuba—Bibliography. **Griffin and Phillips.**

Library of Congress. List of Books relating to Cuba (including references to collected works and periodicals), by A. P. C. Griffin, with Bibliography of Maps, by P. Lee Phillips. Washington: 1898. Size 9 × 6, pp. 62.

This useful catalogue of the literature relating to Cuba in the Library of Congress contains an alphabetical list of books, a chronological list of articles in magazines, etc., from 1829 onwards, and chronological lists of government documents and of maps.

French Guiana. *B.S.G. Com. Paris* **20** (1898): 164–169. **Levat.**

La Guyane et le Contesté franco-brésilien. Par M. Levat.

The author was in French Guiana for five months in 1897, studying the mineral resources of the colony. He considers the placer mining of great promise, provided transport can be secured, and recommends the construction of a railway about 200 miles in length, from Cayenne to the contested area.

Peru—Yquitos. *T. Liverpool G.S.* (1898): 73–75. **Adamson.**
Yquitos, Communication from Mr. D. B. Adamson.

Venezuela. *Globus* 73 (1898): 303–309. **Sievers.**
Richard Ludwigs Reisen auf Paraguaná (Venezuela). Von W. Sievers.

Herr Ludwig travelled through the coast regions of Venezuela, and particularly the Paraguaná peninsula, for twelve years.

West Indies—Bird-Life. *National G. Mag.* 9 (1898): 243–247. **Chapman.**
The Origin of West India Bird-Life. By Frank M. Chapman.

The author has studied the birds of the West Indies for ten years.

AUSTRALASIA AND OCEANIC ISLANDS.

Australia. *P. American Philosoph. S.* 36 (1897): 466–478. **Mathews.**
Rock Carvings and Paintings of the Australian Aborigines. By R. H. Mathews. *With Plate.*

Australia—Great Barrier Reef. **Penck.**
Das grosse australische Wallriff. Vortrag, gehalten den 29 Jänuar 1896 von Prof. Dr. Albrecht Penck.—Vorträge des Vereines zur Verbreitung naturwissenschaftlicher Kenntnisse in Wien. XXXVI. Jahrgang.—Heft 13. Wien, 1896. Size 7½ × 5, pp. 24. *Presented by the Author.*

New Guinea. *A travers le Monde, Tour du Monde* 4 (1898): 193–196. ——
Villages Lacustres et Aériens en Nouvelle-Guinée. *With Illustrations.*

New South Wales. ——
Report of the Department of Public Works for the year ended 30th of June, 1896. Sydney, 1897. Size 13½ × 8½, pp. 96. *Map, Plans, and Plates. Presented by the Agent-General for New South Wales.*

Tasmania. *Papers & P.R.S. Tasmania*, 1897 (1898): 189–196. **Stephens.**
Land Routes for Exploration of the Western Country. By T. Stephens.

Tasmania. *Papers & P.R.S. Tasmania*, 1897 (1898): 142–175. **Walker.**
Notes on the Aborigines of Tasmania, extracted from the Manuscript Journals by George Washington Walker, with an Introduction by James B. Walker.

In 1832 Mr. Walker visited the Tasmanian Aborigines at Flinders island, and his description of the people is now published.

POLAR REGIONS.

Ballooning. **Volante.**
A^{ro} Volante. Strenna Polare, 1898. Invocazione ed auguri mondiali a favore di Andrée. Ossequiosamente dedicata alla O^{ma} Camera dei Deputati, Turino. Size 13 × 9, pp. xvi. *Presented by the Author.*

Circumpolar Currents. *B.G.S. Philadelphia* 2 (1898): 41–54. **Melville.**
A proposed System of Drift Casks to determine the Direction of the Circumpolar Currents and the Drift of the *Jeannette*. By Commodore Geo. W. Melville. *With Chart and Plate.*

This is noticed in the *Journal* for August, p. 194.

Norwegian Polar Expedition. **Nansen, Melville, Heilprin.**
P. American Philosoph. S. 36 (1897): 442–464.
Some Results of the Norwegian Polar Expedition, 1893–96. By Dr. Fridtjof Nansen. With remarks by Commodore George W. Melville and Prof. Angelo Heilprin.

Spitsbergen. *T. Liverpool G.S.* (1898): 41–58. **Gregory.**
Across Spitsbergen. By J. W. Gregory, D.SC.

MATHEMATICAL GEOGRAPHY.

Map Projections. *Ann. Hydrographie* 26 (1898): 163–169. **Hammer.**
Näherungsweise Konstruktion der Mercator-Projektion. Von Prof. Dr. E. Hammer

Nautical Astronomy. *Nature* **58** (1898): 151–154. **Ruthven.**
Nautical Astronomy. By Captain J. F. Ruthven. *With Diagrams.*

On the methods employed for finding position at sea.

Photographic Surveying. *Ann. Hydrographie* **26** (1898): 169–172. **Matthieu.**
Die Sonnenhöhe als Argument zur Auffindung der richtigen Belichtungszeit bei photographischen Aufnahmen. Von Paul Matthieu. *With Plates.*

Terrestrial Latitude. *P. American Philosoph. S.* **36** (1897): 434–438. **Doolittle.**
The Variation of Terrestrial Latitude. By C. L. Doolittle.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geomorphology. **Lapparent.**
Leçons de Géographie Physique. Par Albert de Lapparent. Deuxième Édition. Paris: Masson et C^ie^, 1898. Size 10 × 7, pp. xvi. and 718. *Map and Illustrations. Presented by the Author.*

This is noticed in the Monthly Record for July, p. 83.

Oceanography. *Ymer* **18** (1898): 165–184 **Pettersson.**
Om Atlantiska oceanens inflytande på vårt vinterklimat och om orsaken till den senaste vinterns (1897–1898) blida väderlek. Af Otto Pettersson.

Prof. Pettersson contributed a summary of this paper to the *Journal* for June, vol. xi. p. 611.

Oceanography—Deposits. *Rev. Maritime* **137** (1898): 246–286. **Thoulet.**
Analyse lithologique de fonds marins provenant du golfe de Gascogne. Par M. J. Thoulet.

Oceanography—Red Sea. **Natterer.**
Chemische Untersuchungen in der nördlichen Hälfte des Rothen Meeres. Von Dr. Konrad Natterer. (Kaiserliche Akademie der Wissenschaften in Wien. Sitzung der mathematisch-naturwissenschaftlichen Classe vom 12 Mai 1898.) Size 9½ × 6½, pp. 8. *Presented by the Author.*

Seismology. *P.R.I.* **15** (1898): 326–336. **Milne.**
Recent Advances in Seismology. By Prof. John Milne, F.R.S.

Shore-Formations. **Cornish.**
On Sea Beaches and Sandbanks. By Vaughan Cornish, M.SC. From the *Geographical Journal* for May and June, 1898. Size 10 × 6½, pp. 40. *Maps and Illustrations.*

Terrestrial Magnetism. *American J. Sci.* **5** (1898): 455–462. **Bigelow.**
Comments on Bulletin No. 21. "Solar and Terrestrial Magnetism in their relations to Meteorology." By Frank H. Bigelow.

An abstract of the results of a recent official publication designed to investigate thoroughly the relations between magnetism and meteorology.

Terrestrial Magnetism. *Meteorolog. Z.* **15** (1898): 175–178. **Liznar.**
Die magnetische Aufnahme Oesterreich-Ungarns und das erdmagnetische Potential. Von Prof. J. Liznar.

Zoogeography—Marine Life. *Sitz. k. P.A.W. Berlin* (1898): 102–118. **Dahl.**
Die Verbreitung der Thiere auf hoher See. II. Von Prof. Friedr. Dahl. *With Map.*

Zoogeography—Whales. *Natural Science* **12** (1898): 397–414. **Southwell.**
On the Migration of the Right Whale (*Balæna mysticetus*). By Thomas Southwell. *With Maps.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Colonization. *J.S. Arts* **46** (1898): 633–647. **Lyall.**
Colonies and Chartered Companies. By Sir Alfred C. Lyall, K.C.B., etc.

Commercial Geography. *J.R. United Service I.* **42** (1898): 507–539. **Winter.**
The Protection of Commerce during War. By Captain C. F. Winter. *With Maps.*

Commercial Geography—Indiarubber. *Mouvement G.* **15** (1898): 259–262. **Kerckhove.**
Le commerce du caoutchouc. Par G. Van den Kerckhove.

The annual export of indiarubber from the Congo Free State now amounts to about 1600 tons. The total production of the world for 1897 is estimated at 34,000 tons, of which 19,400 tons come from Para, 2400 from Central America, 10,500 from Africa, and 1700 from Asia. This does not take account of guttapercha.

Historical. *B.S.R. Belge G.* **22** (1898): 85–112. **Du Fief.**
Les découvertes maritimes des Portugais au XV^{e} siècle. Par J. Du Fief. *With Map.*

Historical—Al-Battani. *Cosmos* **12** (1894–96): 161–183. **Nallino.**
Le tabelle geografiche d'al-Battânî, tradotte ed annotale dal dott. prof. C. A. Nallino.

A translation of the tables of positions of 273 localities compiled by Al-Battani in the tenth century.

Historical—Alexander. *Sitz. k. P.A.W. Berlin* (1898): 120–134. **Köhler.**
Die Eroberung Asiens durch Alexander den Grossen und der Korinthische Bund. Von Ulrich Köhler.

Historical—Barents. *C.Rd. S.G. Paris* (1898): 157–162. **Cordier and Rabot.**
Centenaire de Barents. A la recherche d'un passage vers l'Asie par le Nord-Ouest et le Nord-Est. Par M. Henri Cordier.—Les trois voyages de W. Barents (1594–97). Par M. Ch. Rabot

The Paris Geographical Society has commemorated by a special meeting the third centenary of the death of the great Dutch arctic explorer Barents, whose memorable voyage round the north end of Novaya Zemlya, his wintering there, and his great boat journey back to civilization form one of the finest pieces of arctic work ever performed.

Historical—Cabot. **Beazley.**
John and Sebastian Cabot. The Discovery of North America. By C. Raymond Beazley. (Builders of Greater Britain. Edited by H. F. Wilson, M.A.) London: T. Fisher Unwin, 1898. Size 8 × 5½, pp. xx. and 312. *Portrait and Maps. Price 5s. Presented by the Publisher.*

This is a very careful study of the life and the voyages of the two Cabots with reference to the part they took in the discovery of the American continent, and to the search for the north-east passage. The old maps reputed to be the work of Sebastian Cabot are described and discussed, and two valuable bibliographical appendices are given, one detailing 53 documents bearing on the English life of the Cabots, the other with the titles of 113 books or memoirs relating to them.

Historical—Vasco da Gama. **Cordier, Védel, La Mazelière.**
C. Rd. S.G. Paris (1898): 189–203.
Centenaire de Vasco de Gama. Relations de l'Europe et de l'Asie avant et après le voyage de Vasco de Gama. Par M. Henri Cordier.—Voyage de Vasco de Gama. Par M. Émile Védel.—L'Inde à l'époque de Vasco de Gama. Par M. le Marquis de La Mazelière.

Historical—Vasco da Gama. **Delvaux.**
B.S.R. Belge G. **21** (1897): 301, 448, 600; **22** (1898): 30, 137.
Vasco de Gama et les découvertes maritimes des Portugais. Par Georges Delvaux.

BIOGRAPHY.

Gardner. **Pearse.**
Soldier and Traveller. Memoirs of Alexander Gardner, Colonel of Artillery in the service of Maharaja Ranjit Singh. Edited by Major Hugh Pearse. With an Introduction by the Right Hon. Sir Richard Temple, Bart, G.C.S.I. London: W. Blackwood & Sons, 1898. Size 9 × 6, pp. xxxiv. and 360. *Portraits and Map. Price 15s. Presented by the Publishers.*

A note on this remarkable book will be given.

Goulier. *B.S. Languedoc G.* **20** (1897): 355–362, 423–446. **Fulcrand.**
Le Colonel Goulier. Par le Colonel Fulcrand.

Colonel Goulier was born in 1818 and died in 1891. He was distinguished as a surveyor, and invented many instruments of precision.

Hüttner. *M. Ver. Erdk. Leipzig* (1897): 1–37. **Gedan.**
Johann Christian Hüttner. Ein Beitrag zur Geschichte der Geographie. Von Paul Gedan.

Hüttner, born 1766, died 1845, was secretary to Sir George Staunton on the staff of Macartney's embassy to China in 1793, and afterwards devoted most of his life to the translation into German of English books of travel.

Sigsbee. *National G. Mag.* 9 (1898): 250–252. **Gannett.**
Captain Charles D. Sigsbee, U.S.N. By Henry Gannett. *With Portrait.*

Captain Sigsbee is distinguished for his services to oceanography, rendered while acting for the Coast and Geodetic Survey.

GENERAL.

British Empire—Rainfall. **Hopkinson.**
Quarterly J.R. Meteorolog. S. 24 (1898): 148–161.
Monthly and Annual Rainfall in the British Empire, 1877–96. By John Hopkinson.

Rainfall statistics for different places in the British Empire, averaged for various periods of time, and combined in order to show certain relations for the British Empire as a whole, which can scarcely be viewed as a satisfactory unit for climatic considerations.

Education—Methods. **Reclus.**
Université Nouvelle de Bruxelles. Institut Géographique. Size 9 × 6, pp. 4.

This plan of geographical education is referred to in the *Journal* for July, p. 84.

Educational—Bibliography. *J. School G.* 2 (1898): 181–191. **Platt.**
The Better Books in School Geography. By Mary I. Platt.

Notes on books suited for teachers and pupils.

Educational—Methods. *J. School G.* 2 (1898): 170–181. **Davis.**
The Equipment of a Geographical Laboratory. By W. M. Davis.

This will be specially noticed.

Educational—Pictures. **Dubois and Guy.**
Album Géographique. Par MM. Marcel Dubois et Camille Guy. Tome II. Les régions tropicales. Paris: A. Colin & Cie., 1897. Size 11½ × 9, pp. xx. and 244. *Illustrations.*

Italians Abroad. ———
Bollettino del Ministero degli Affari Esteri, Aprile, 1898. Parte Generale. Le Società Italiane all'estero. Roma: Libreria Bocca, 1898. Size 9½ × 6½, pp. 110.

On the number of Italians living out of Italy, with statistics.

Medical Advice. **Crosse.**
Short Medical Notes for Explorers. W. H. Crosse. [For Private Circulation.] London: E. T. Heron & Co. Size 7 × 5, pp. 36. *Presented by the Author.*

Portuguese Colonization. ———
Quarto centenario do Descobrimiento da India. Vasco da Gama. Les Colonies Portugaises dans l'Afrique, l'Asie et l'Amérique. Les relations entre les Portugais et les Hollandais dans leurs colonies. Catalogue de Livres en vente chez Martinus Nijhoff à la Haye (Hollande) 1898. Size 10½ × 8, pp. 44.

Scenery and Literature. **Geikie.**
The Romanes Lecture, 1898. Types of Scenery and their Influence on Literature. By Sir Archibald Geikie, D.C.L., F.R.S. London: Macmillan & Co., 1898. Size 9 × 6, pp. 60. *Price 2s. Presented by the Publishers.*

This was noticed in the *Journal* for July, p. 68.

Smithsonian Institution. **Goode.**
The Smithsonian Institution, 1846–1896. The History of its First Half Century. Edited by George Brown Goode. Washington, 1897. Size 11½ × 8, pp. x. and 856. *Portraits. Presented by the Smithsonian Institution.*

An interesting record of the romantic circumstances attending the foundation of the Smithsonian Institution, and the vast results which have followed its establishment and administration.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Johnston.**

Modern Map of England and Wales. Scale 1 : 443,520 or 7 stat. miles to an inch. W. & A. K. Johnston, Edinburgh and London. 4 sheets. *Price, mounted on cloth, 14s. Presented by the Publishers.*

This is a new and revised edition of Johnston's map of England and Wales, on the scale of 7 stat. miles to an inch. It shows all important roads, railways, rivers, canals, towns, villages, ancestral seats, lighthouses, and light-vessels, and an attempt has been made to indicate the relief of the country by hachuring. The map can be obtained mounted on rollers, folded in case, or in sheets unmounted.

England and Wales. **Bartholomew.**

New Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 24, Oxfordshire. J. Bartholomew & Co., Edinburgh, 1898. *Price 2s., mounted on cloth. Presented by the Publishers.*

England and Wales. **Ordnance Survey.**

Publications issued since July 8, 1898.

1-inch—General Maps:—

England and Wales (revision):—21, 50, 53, 62, 67, 95, 215, 227, 231, 263, engraved in outline. 1s. each.

6-inch—County Maps:—

England and Wales (revision):—**Durham**, 3 s.e., 6 n.e., s.w., 7 n.w., 8 s.w., 12 n.w., s.w., s.e., 13 n.w., n.e., s.w., s.e., 14 n.w., s.w., s.e., 17 n.w., s.w., s.e., 18 n.w., n.e., s.w., s.e., 19 n.w., n.e., s.w., s.e., 20 n.w., s.w., s.e., 21 n.w., n.e., s.w., s.e., 22 s.e., 23 n.e., s.w., s.e., 24 n.w., n.e., s.w., s.e., 25 n.w., n.e., s.w., s.e., 26 n.w., n.e., s.w., s.e., 27 n.w., n.e., s.w., s.e., 28 n.w., n.e., s.w., s.e., 29 s.w., 30 s.e., 31 n.w., 32 n.w., n.e., 34 n.w., s.e., 35 n.w., n.e., s.w., s.e., 36 n.e., s.w., s.e., 41 s.w., 43 n.w., n.e., s.e., 44 n.w., n.e., 45 n.w., 48 n.e., s.w. **Essex**, 2 s.e., 3 s.w., s.e., 4 s.e., 6 n.w., s.w., 8 n.w., 10 n.w., 11 s.e., 14 n.w., 17 n.e., 20 s.e., 29 n.e., 37 s.w., 38 n.e., s.w., 39 n.w., 65 s.w., s.e., 73 s.w., 74 s.e., 79 n.w., 82 n.e., 83 s.e. **Hampshire**, 6 s.w., 13 n.w., 68 s.e. **Kent**, 3 s.w., 17 n.e., 9 n.e., 11 s.w., 28 s.w., 31 n.w., s.e., 42 n.e., 54 s.w., s.e., 60 n.e., s.w., 61 n.w., s.w., 63 s.e., 64 s.w. **Northumberland**, 59 n.e., s.w., s.e., 60 s.w., s.e., 62 n.w., 66 n.w., 67 n.e., 81 s.w., s.e., 88 n.e. **Sussex**, 11 s.w., 13 n.w., 21 s.w., 23 n.w., s.w., 24 s.e., 35 s.e., 36 n.w., s.e., 37 n.e., s.w., s.e. **Surrey**, 15 n.e., s.e., 28 s.w., 30 n.e., 32 s.w., 36 s.w., 39 s.e., 40 s.e., 46 n.w., n.e.

25-inch—Parish Maps (revision):—

England and Wales:—**Cheshire**, VIII. 11, 16; IX. 5, 16; X. 8, 13; XVII. 2, 8, 10, 11, 12; XVIII. 2, 5; XIX. 2; XX. 1; XXVI. 15; XXVII. 13; XXXIV. 3, 7, 11, 14, 15, 16; XL. 4, 10, 14, 16; XLI. 2, 3, 6, 7, 10, 15, 16; XLII. 5; XLVII. 8, 15; XLVIII. 2, 3, 5, 9, 10, 13, 14; L. 8; LIV. 6, 8, 10; LV. 3, 5, 7, 9, 10, 11, 13; LVI. 9, 15; LXI. 6, 7, 8, 15; LXII. 10, 11, 12, 14, 15, 16; LXV. 4; LXVI. 2, 6. **Derby**, II. 16; III. 13; VII. 12; IX. 13; X. 5, 12; XI. 7, 8, 11, 16; XII. 4, 6, 7, 8, 13, 14, 15; XIII. 1, 5, 9, 10; XV. 1, 2, 4, 6, 7, 8, 9, 10, 11, 12; XVI. 6, 9, 13, 14, 15, 16; XVII. 3, 4, 5, 8, 12; XVIII. 2, 3, 5, 6, 8, 9. **Hampshire**, LXXVIII. 13, 16; LXXIX. 13; LXXXIII. 16; LXXXIV. 9; LXXXV. 4; LXXXVII. 1, 4, 5, 9, 13; XCVI. 14; XCVII. 7, 13; XCVIII. 8, 11, 12; XCIX. 1, 2, 9, 13; C. 1, 2, 3. **Hertfordshire**, I. 16; IV. 1, 5, 9; V. 10, 11; VI. 7, 10, 11, 12, 14, 15; VII. 1, 3, 5, 6, 11, 13; VIII. 2; IX. 11, 12; XI. 2, 3, 4, 8, 14, 15; XII. 3, 6, 13, 15; XIV. 13; XVIII. 16; XIX. 2, 13; XX. 3, 4, 5, 15, 16; XXI. 4, 5, 14, 16; XXII. 14, 15; XXVI. 4, 7, 8, 12; XXVII. 1, 8, 12, 14, 15; XXVIII. 12, 13, 16; XXIX. 2; XXX. 2, 3, 10; XXXI. 5; XXXIII. 1, 2, 6, 8, 16; XXXIV. 12; XXXV. 1, 4, 5, 13; XXXVI. 15; XXXVIII. 3, 4, 7; XXXIX. 5, 9, 13; XL. 4; XLIV. 1, 2, 5, 9, 13, 14. **Kent**, XIII. 1, 5, 9, 10, 13, 15; XV. 7; XIX. 7; XXI. 1, 5, 6, 13; XXV. 8, 10, 16; XXVI. 1; XXXVII. 1, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14; XXXVIII. 5; XLVI. 4, 8; XLVIII. 1, 2, 4, 5, 6, 9, 11, 14, 15; LVIII. 2, 6; LVIIIa. 1; LXVII. 12; LXX. 1, 3, 5, 7, 9; LXXI. 1, 4, 6, 7, 11, 12, 13, 14, 15; LXXIV. 1, 2, 3, 4, 5, 6, 12; LXXV. 3, 5; LXXX. 2, 5, 6; LXXXI. 3, 5; LXXXII. 5. **Northumberland**, XIII. 1, 6, 9, 10, 13, 14; XVIII. 2, 3. **Surrey**, VI. 15, 16; VII. 1, 2, 6, 10, 14, 15; XIV. 1, 3, 5, 7, 11, 13, 14; XXXVII. 10. **Sussex**, XX. 4; LX.

2, 10, 14; LXV. 5, 12; LXXII. 2, 6; LXVI. 5. **Westmoreland,** XII. 12, 14, 15; XIII. 3, 7, 9, 11, 12, 14, 15, 16; XVIII. 12; XIX. 3, 4, 7, 9, 13; XX. 3, 4; XXV. 3, 4, 6, 7, 11, 12 and 16; XXVI. 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 15, 16; XXVII. 1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 13, 14; XXVIII. 5, 6, 7, 8, 9, 10, 11, 12; XXX. 3 and 4; XXXII. 3, 2 and 6, 4, 7, 8, 12, 15, 16; XXXIII. 1, 2, 5, 6, 9; XXXIV. 1, 5, 12, 16; XXXVII. 2 and 6, 3, 4, 7, 8, 10 and 11, 12, 14 and 15, 16; XXXVIII. 1, 2, 5, 8; XXXIX. 12, 16; XL. 9; XLI. 2 and 6; XLV. 4, 8; XLVI. 5. *Price* 3*s.* each.

Miscellaneous:—One-inch Parish Indexes, printed in colours, showing 25-inch parish maps only: Sheets 283, 284, 285, 286, 287, 288, 299, 300, 303, 304, 306, 321, 331, 344, 345. *Price* 1*s. each.* These are also published showing 6-inch quarter-sheets only. *Price* 1*s. each.*

(*E. Stanford, Agent.*)

Scotland. **Johnston.**

W. & A. K. Johnston's "Three Miles to the Inch" Map of Scotland. Scale 1:190,080 or 3 stat. miles to an inch. W. & A. K. Johnston, Edinburgh and London, 1898. *Price* 1*s. each sheet.* 16 sheets. *Presented by the Publishers.*

The scale upon which this map is drawn is sufficiently large to admit of a very fair amount of detail being shown without overcrowding, and it will, therefore, be found useful to tourists and others. The map is, of course, based upon the Ordnance Survey, but it has been revised by persons acquainted with the various districts in order to ensure the greatest possible accuracy. The names of hills and glens, contours for every 500 feet, heights above sea-level, and main roads, are shown in brown; names of towns and villages, smaller roads and railways, in black; all water in blue, and the principal forests by green. The counties are distinguished by different colours in the usual manner.

ASIA.

Japan. **Launay.**

Carte des Missions Catholiques au Japon. Par Adrién Launay de la Société des Missions Etrangères. Scale 1:2,200,000 or 34·2 stat. miles to an inch. Dessiné et gravé par R. Hausermann, Paris, 1898. Supplément au *Journal les Missions Catholiques*, 22 Avril 1898.

AMERICA.

British North-West America. **Surveyor-General's Office.**

Canadian Government Surveys: Yukon Map. Scale 1:380,160 or 6 stat. miles to an inch. Sheet 1. Surveyor-General's Office, Ottawa, 1898. *Price* 25 *cents. Presented by the Surveyor-General of Canada.*

The present sheet of the Yukon Map of the Canadian Government Survey Department is important, as, in addition to showing the glaciers in the neighbourhood of Mount Fairweather, and the coast-line from Dixon harbour to a few miles north of Cape Fairweather, it contains plans, on the scale of 1·26 stat. miles to an inch, of the Chilkoot and White passes, and the Bonanza and Eldorado creeks, and another of the town of Dawson, on the scale of 580 feet to an inch. All of these are from the most recent surveys; but, with regard to the plan of the Chilkoot and White passes, it is stated that the mapping of the country to the north of the summits can only be considered approximate. In the south-east corner, there is an inset of Alaska and British Columbia, which serves as an index to the whole map.

GENERAL.

Facsimile Maps. **Miller.**

Mappaemundi, Die ältesten Weltkarten. Herausgegeben und erläutert von Dr. Konrad Miller, Prof. am K. Realgymnasium in Stuttgart. VI. (Schlussheft.) Rekonstruierte Karten. Ueber die Rekonstruktion der alten Weltkarten, Taf. 1; Die Weltkarte des Ravennaten, 7 Jahrh. Taf. 2; Die Weltkarte des Isidor von Sevilla, 7 Jahrh. Taf. 3; Die Weltkarte des Orosius, Anf. 5 Jahrh. Taf. 4; Sphæra Julii Honorii, 4 Jahrh.; Die Fragmente des Orbis Romanus von Ammianus Marcellinus, 4 Jahrh. Taf. 5; Das 1. Segment der Castoriuskarte, 4 Jahrh. Taf. 6; Der Pinax Dionysii, 2 Jahrh. n. Chr. 7; Die Weltkarte des Pomponius Mela, 1 Jahrh. n. Chr.; Die Karten zu Dimensuratio und Tacitus u. a. Taf. 8; (1 and 2) Die Erdbilder des Eratosthenes und Strabo, Hipparch, Polyb. und Artemidor, Taf.

8; (3) Die Klimatenkarte des Plinius u. a. Anhang; Die Mosaikkarte von Madaba, 6 Jahrh. Stuttgart: Jos. Roth'sche Verlagshandlung, 1898. *Price* 10 *marks.*

The issue of this part completes Dr. Konrad Miller's very interesting and useful series of facsimiles and reconstructions of the oldest maps of the world, the publication of which was commenced three years ago. The work of reproduction has been, generally speaking, very creditably performed, and the letterpress which accompanies the maps adds considerably to their value. Students of historical geography have to thank Dr. Miller and the publishers for placing within their reach, at a reasonable price, facsimiles of some of the most interesting early maps of the world.

The World. **Vivien de Saint Martin and Schrader.**

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Paris: Librarie Hachette et Cie. Sheet 6. Europe Physique. *Price* 2 *fr.*

Sheet 6 of this atlas consists of a carefully and artistically executed physical map of Europe, showing heights of land and depths of water by a system of contours and colouring. It is accompanied by explanatory letterpress.

The World. **Andree.**

Andrees allgemeiner Handatlas, 126 Haupt- und 130 Nebenkarten auf 186 Kartenseiten, nebst alphabetischem Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Bielefeld und Leipzig: Verlag von Velhagen & Klasing, 1898.—Lief 21, Elsass.Lothringen, Baden, Württemberg und Rheinpfalz: Schottland.—Lief 22, Rheinland und Westfalen, Fürstentum Lippe und Gross—Herzogtum Luxemburg: Irland, Dänemark.—Lief 23, Untere Donauländer und Türkei, Westliche Hälfte: Südöstaustralien: Neuseeland und Tasmanien.

The World. **Bartholomew.**

The Citizen's Atlas. One hundred maps and gazetteer. By J. G. Bartholomew, F.R.G.S. Published by George Newnes, Ltd., London. To be completed in 20 parts, issued fortnightly. Part 11. *Price* 6*d.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during May and June, 1898. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
2584 m =	3·0	Orkney islands:—Approaches to Kirkwall. 2*s.* 6*d.*
1662 m =	1·2	Norway, west coast:—Skudesnæs fiord and approach to Stavanger. 2*s.* 6*d.*
2965 m =	0·35 0·75	Arctic Russia, river Yenisei, Cape Sopochnaya, Karga to Yakovleva Kosa. Dickson harbour and approaches. 1*s.* 6*d.*
2962 m =	2·0	Arctic Ocean:—The North cape to Einsamkeit island, including the Barents and Kara seas (plan, Yugorski strait). 2*s.* 6*d.*
2964 m =	0·23	Arctic Russia:—Head of the gulf of Ob. 1*s.* 6*d.*
2980 m =	0·27	Iceland, south coast:—Storksnæs to Portland. 2*s.* 6*d.*
2979 m =	0·28	Iceland, east coast:—Niardvig to Storksnæs. 1*s.* 6*d.*
2978 m =	0·28	Iceland, north coast:—Sigle fiord to Niardvig. 2*s.* 6*d.*
2977 m =	0·28	Iceland, north coast:—North cape to Sigle fiord, etc. 2*s.* 6*d.*
1550 m =	1·8	Iceland, east coast:—Reydar and Faskrud fiords. 2*s.* 6*d.*
2976 m =	0·3	Iceland, west coast:—Snefells Jökel to North cape. 2*s.* 6*d.*
3000 m =	3·7	Iceland, north-west coast:—Hesteyre fiord. 1*s.* 6*d.*
1636 m =	var.	Iceland, east coast:—Beru fiord, Djupavog, Heimaey trading station. 2*s.* 0*d.*
2998 m =	1·5 6·0	Iceland, north-west coast:—Dyra fiord, Haukadalr, Thingeyre. 1*s.* 6*d.*
2999 m =	2.7 7·4	Plans on the north-west coast of Iceland:—Patrix fiord, Svendseyre. 1*s.* 6*d.*
3001 m =	var.	Plans on the north coast of Iceland:—Sigle fiord, Akureyre, Skagestrands harbour. 1*s.* 6*d.*
2004 m =	6·0	Plans on the east coast of Iceland:—Vapna fiord trading station. 1*s.*
2997 m =	var.	Plans on the north-west coast of Iceland:—Muslingen channel, Skutils fiord and Pollen harbour. Flateyre anchorage, Bildal anchorage. 1*s.* 6*d.*
1230 m =	0·07	Africa, west coast:—Garnet head to Cape Verde (plans, Ouro river, Arguin bay, Portendick anchorage). 3*s.*

1355 m = 0·08	Malacca strait with part of the east coast of the Malay peninsula. 2*s.* 6*d.*
1430 m = 2·6	Russian Tartary:—Slavianski bay. 1*s.* 6*d.*
1529 m = 0·25	Banks between Rotumah and Samoa islands:—Robbie bank, Pasco bank, Tuscarora bank and Adolph knoll, Waterwitch bank, Lalla Rookh bank and Home knoll, Field and Faviuni banks. 1*s.* 6*d.*
170	Cefalù to Mazzara:—Plan added, Termini Imerese.
1455	Anchorages on the west coast of Greece:—Plan added, Butrinto bay.
2232	Odessa to Sevastopol:—Plan added, Akmechet harbour.
2230	Bosporus to Cape Kaliakra:—Plan added, Inada road.
2216	Turkish ports on the south shore of the Black sea:—Plan added, Koslu bay.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
2584	Approaches to Kirkwall.	New Chart. Approaches to Kirkwall	2584
2292	Akmechet harbour.	New Plan. Akmechet harbour on chart	2232
2204	Inada road.	New Plan. Inada road on chart	2230
2294	Koslu bay.	New Plan. Koslu bay on chart	2216
2282	Plan of Yugorski strait on this sheet.	New Plan. Yugorski strait on chart	2962
1230	Cape Bojador to Cape Blanco.	New Chart. Garnet head to Cape Verde	1230
1231	Cape Blanco to Cape Verde.		
605	The river Ouro.		
1430	Slavianski bay.	New Chart. Slavianski bay	1430
1431	Plan of Waterwitch bank on this sheet.	New Chart. Banks between Rotumah and Samoa islands	1529

Charts that have received Important Corrections.

No. D, Index chart:—North, Baltic, and White seas; Iceland. 2810, Ireland, east coast:—Lough Carlingford entrance. 2800, Ireland, east coast:—Lough Carlingford, Newry river. 2270, White sea:—Mount Sozonova to Kouzminskia hills, etc. 2278, White sea. 2274, White sea:—Kammenoi point and Unskaia inlet to Tolstik and Chesminskoi points. 2277, White sea:—Sharapov head to Ludoshnoi point. 2280, White sea, Arkhangel bay, etc. 2061, White sea:—Approaches to Kem. 2275, White sea:—Gulf of Onega. 1770, Gulf of Riga:—Port of Libau. 304, France, west coast:—Port Louis and Lorient. 234, Egypt:—Port Said. 867, Bermuda:—The Narrows to Hamilton. 1690, Newfoundland:—Hawke bay to Ste. Geneviève bay, etc. 284, Newfoundland:—Cow head harbour to Ste. Geneviève bay, etc. 2918, Newfoundland:—Port Saunders and Keppel and Hawke harbours. 332, Lake Erie. 1731, Lake Huron:—Parry sound and approaches. 2854, Harbours in the Gulf of Mexico. 530, South America, east coast:—Victoria to Santa Catharina. 1331, South America, east coast:—Port Belgrano (Bahia Blanca), etc. 461, Africa, west coast:—Wari and Benin rivers and creeks. 1862, Africa, west coast:—Lekki to river Dodo. 1357, Africa, west coast:—River Benin to river Cameroon, etc. 1361, Africa, west coast:—Fernando Po to Cape Lopez. 627, Africa, west coast:—St. Paul de Loanda to Great Fish bay. 40, India, west coast:—Karáchi harbour. 2637, Strait of Makassar, south part. 1269, Cochin China:—Saigon river, etc. 2695, Yang tse Kiang:—Tung liu to Hankau. 2809, Yang tse Kiang:—Shanghai to Nanking. 2678, Yang tse Kiang:—Nanking to Tung liu. 1236, China:—Approaches to Port Arthur, etc. 83, Japan:—Channels between Misima Nada and Iyo Nada. 379, Fiji islands;—Vatu Ira channel with adjacent coasts. 1112, Pacific ocean:—Manga Reva or Gambier islands.

(*J. D. Potter, Agent.*)

United States Charts. **U.S. Hydrographic Office**

Pilot Charts of the North Atlantic and North Pacific Oceans for July, 1896. Published at the Hydrographic Office, Washington, E.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Chile and West Coast of Central and South America. **Leblanc.**

One hundred and fifty-six Photographs and photogravures of Chile and West Coast of Central and South America, taken by F. Leblanc, of Santiago de Chile. *Presented by Lieut. T. Dannreuther, R.N.*

With a few exceptions, this series consists of views of scenery, cities and towns, inhabitants, etc., of Chile; the remainder being of Colon, Panama, Guayaquil, Payta, and Trujillo. One hundred and forty-four are photogravures, and both these and the photographs are, for the most part, very excellent productions. The following is a list of the subjects:—

Photographs. (1) Venta de Mote; (2) Choza, Araucana; (3) Oda del Salto; (4) Mote Moli . . . do; (5) Cájon de la Rio Colorado camino San Jose de Maipo; (6) Valle de los Herones, Aconcagua (Cerro); (7) Rio Colorado en et Paramillo de las Vacas.

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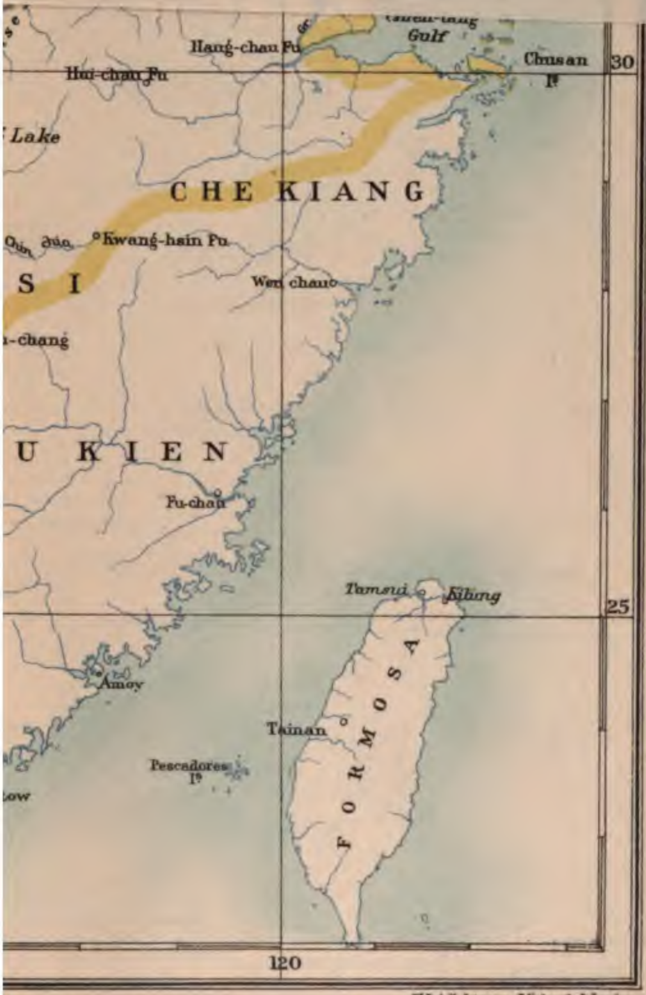

W. & A.K. Johnston. Edinburgh & London.

United States Charts. **U.S. Hydrographic Office**

Pilot Charts of the North Atlantic and North Pacific Oceans for July, 1898. Published at the Hydrographic Office, Washington, E.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Chile and West Coast of Central and South America. **Leblanc.**

One hundred and fifty-six Photographs and photogravures of Chile and West Coast of Central and South America, taken by F. Leblanc, of Santiago de Chile. *Presented by Lieut. T. Dannreuther, R.N.*

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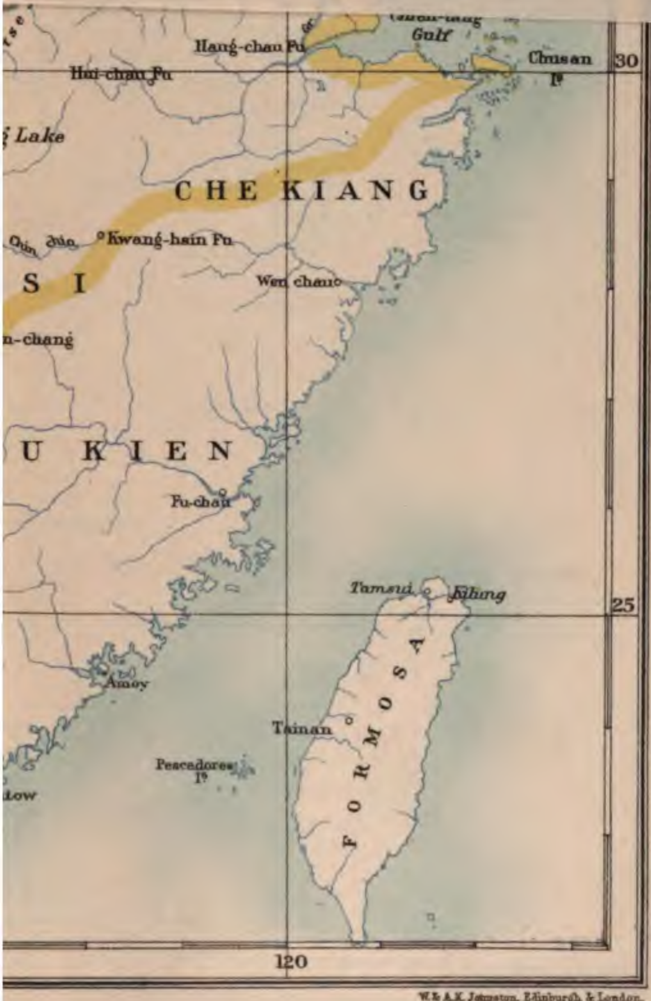

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No. 4. OCTOBER, 1898. Vol. XII.

TIRAH.*

By Colonel Sir T. H. HOLDICH, R.E., K.C.I.E., C.B.

The name Tirah is an elastic geographical expression applied to those highlands divided between the Afridi and Orakzai tribes, which lie between the Khybar and the Kuram. Tirah (or the Tirah, as it has become customary to call it) lies about midway between the two valleys; but it dominates neither, for the eastern extremity of the great Sufed Koh range and the upper reaches of the Bara valley shut it off from the Khyber, whilst the Samana range hedges it in on the south, and with other minor watersheds forms a serious obstacle to approach from the Kuram side. It is this inaccessibility which has hitherto saved Tirah from the attentions of European explorers. It is a species of *cul-de-sac*, possessing little or no strategic value, and interesting as it may have been in the field of speculative geography, its gates have hitherto been too well guarded for the explorer to do more than just look over the hedge. From time immemorial its climate and fertility have rendered it a theme of admiration to the border tribesman, whose poetic rhapsodies on its eternal verdure and its surpassing loveliness have at length been translated into the commonplace official prose of the *War Office Gazetteer*. The highlands of Tirah are now as well known as the Khyber or the Kuram valleys.

From the Sufed Koh range there strikes off in about longitude 70° 25′ a subsidiary watershed, which, running to the south-east, encloses between itself and the southern slopes of the Sufed Koh the head of the Rajgul valley, which is watered by one of the chief affluents of the Bara river. After 15 miles of this south-easterly trend it suddenly bends southwards, and thenceforward divides the heads of the Bara, the Mastura, and the Khanki rivers, all of which flow eastward, from those other subsidiary streams which flow south-westward to the Kuram. The highlands to the eastward of this meridional watershed are locally known as Tirah; those to the westward, belonging to the Chamkanni, the Massozai, and other tribes, are not usually called Tirah, although in the matter of elevation and general topographical conformation they are very much the same as the eastern uplands. Of the rivers running eastward, the Bara and the Mastura unite in the midst of a network of intricate ravines near Mamani, which was for some time our advanced post on the Bara line; and the Khanki finds its way to a junction with the Meranzai stream not far from Kohat. The Tirah highlands being formed by the heads of the Bara, Mastura, and Khanki (the former being Afridi Tirah and the two latter Orakzai), it follows that any one of these rivers will give direct access to them without the intervention of any mountain pass whatsoever; and that to reach the Tirah in any other way it is necessary either to cross the meridional watershed by the Losaka or other passes which connect it with the Kuram valley, and thus enter at its head; or else to approach from either the northern or southern flank and to cross a succession of passes dividing the upper affluents of the Tirah drainage from each other. No one of these methods of approach is easy. On the contrary, they all bristle with physical difficulties, either from the altitude and roughness of the passes to be negotiated, or from the terrible defiles which beset the river routes, along which road-making even of such quality as might admit the passage of mules is a practical impossibility without an inadmissible expenditure of time and labour. In the late campaign military considerations dictated the latter course, and Tirah was approached from the southern, or Meranzai, flank. Thus the *entrée* was effected sufficiently near its head to turn all dangerous river defiles, and to drop straight into the most highly cultivated and thickly populated part of the district by the shortest possible line, which was, it may be added, the line which was most readily defensible against attack. This course involved the passage of three passes, *i.e.* the Chagru (5525 feet), near Dargai, which connects the Meranzai and Khanki valleys across the now historical Samana range; the Sanpagha (6550 feet), which leads from the Khanki to the Mastura valley (all this being within Orakzai limits); and the Arhanga (7050 feet), which dropped on its northern side into the upland called Maidán, where we first made acquaintance with the Afridi on his own uplands. None of these passes would have presented any serious obstacle to a single traveller unburdened with heavy baggage; but to the formidable array of an army corps transport —numbering from 15,000 to 20,000 baggage animals, who followed the fighting force in single file, where every shifting load or fallen animal meant the stoppage of 15 miles of transport—it is no great matter of astonishment that they proved difficult to negotiate within reasonable limits of time. An excellent road now spans them all, and future generations of Afridis may thank us for opening out a practicable route for camel transport which will much facilitate their trade, the amount of which has been shown to be quite worth consideration.

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* Paper read at the Royal Geographical Society, June 20, 1898. Map, p. 444.

Close under the Chagru pass, on the southern side of it, lies the post of Shinawari. A dreary little detached fort, strongly built of stone, was the original outward sign of our occupation. It overlooks the Meranzai valley from an eminence formed by a detached excrescence of one of the southern spurs of the Samana, and is only a few hundred feet above the general level of the watershed which, near this point (at Kai), parts the upper and lower Meranzai valleys.

A CAMP IN TIRAH.

Shinawari looks down from the head of the upper Meranzai as it shelves gently westward towards Thal at the foot of the Kuram valley over scenery which is by no means unpicturesque. The gigantic mass of Dingsar shapes itself in grand outlines about 10 miles to the west, as rugged and massive a frontier landmark as may be found north of the Kuram. The lower slopes of Samana and the jagged spurs of Dingsar alike are patched with a growth of evergreens, amongst which the dark hues of the wild olive are well contrasted with the lighter sheen of low-growing scrub, including masses of dwarf palm and occasional pomegranate. In the month of October, the deep-shadowed rocks and twisted olives, backed by a vivid blue sky, are suggestive rather of the genial temperature and climate of Italy, than of the brassy blaze of white hot summer so familiar to the frontier official. Meranzai in the late autumn is almost beautiful.

From Shinawari, a white streak curling away northward denotes the road to the Chagru pass, which has recently been cut out of the rocky sides of a convenient spur leading thereto. And here it may be remarked that all road-making has been comparatively easy. The hills rest on a core of nummulitic limestone as hard as flint, but the surface rocks are usually weather-worn, and readily amenable to pickaxe and spade.

On either side the Chagru (which lies as a depression or saddle in the Samana ridge) are the dominating peaks of Dargai and Narik Suk to the west, and of Samana Suk to the east. It was the possession of Dargai peak which gave the Orakzai such command of the pass, and the story of its capture is one which will ever live in history with certain military morals attached thereto.

From the kotal, or pass, to the Khanki valley the descent is short, and only steep for the first mile or so, the total fall to the Khanki river-bed being less than 1000 feet. It could hardly be regarded as a severely difficult pass even before road-making was effected, the exceeding narrowness of the track as it left the pass being the only cause of the terrible congestion of transport traffic which supervened on the capture of the position.

The Khanki valley offers no special attractions in the matter of scenery. The flanking mountains are ragged and rough, and unbroken by any marked peaks or fantastic outlines, such as usually give a weird sort of charm even to the most desolate frontier landscape. The long slopes of the mountain spurs gradually shape themselves downwards into terraced flats bounded by steep-sided ravines along which meander a few insignificant streams, of which the Khanki and the Kandi Mishti are the principal; and the whole scene is "washed in" with a flat tint of ochre, unrelieved by the brilliancy of continual verdure such as we find further on. On a terraced slope lying between the Khanki and the Kandi Mishti ravines, under the pass of Sanpagha, stands a mud-wall enclosed village with a grove of trees near by, and it is near this village (called Gandaki) that the road to Sanpagha runs after crossing the Kandi Mishti declivities, ere it winds its devious course up a long spur to the pass. A mile or so above Gandaki, sloping steeply up from the river-bed, there occurs a local eminence, in the centre of which was found a convenient base for the first artillery position, when the pass was captured, and this position afforded a very fine view of the pass itself. Right in front lay the brown folds of the Sanpagha spurs, one long sinuous arm stretching directly downwards to the river as if to offer a convenient line of approach to the depression on the range which marked the position of the pass. On this spur a conspicuous rounded knoll, looking innocently unsuggestive, concealed the "sungars" from which a crowd of Orakzai defenders fled into the shadowed rifts of the mountains as the artillery shells dropped neatly into the midst of them; and on this knoll the artillery took up its second position after struggling up the steep hillsides in rear of the storming party. Here, too, after the advancing wave of attack had passed on, I found amongst the half-dried and crushed vegetation, sprinkled with fragments of shells and shreds of torn clothing, blossoms of Alpine gentian uplifting their deep blue bells to the deep blue sky.

To the right front, high up, under the lee of the ridge lay the hidden village of Nazena. This was occupied by the right attack. To the left front, balanced evenly on either side a precipitous torrent bed, and leaving much to the imagination as to possible means of intercommunication, were two villages (or the two halves of one village), called Kandi Mishti. This occupied the attention of the left attack, and was soon a grey heap of smoking ruins. The conformation of the pass and its surroundings was almost a repetition of Chagru and Dargai. A succession of steep hills in steps overhung its western flank, and afforded excellent opportunity for a plunging fire on to the road beneath. These had to be carried in succession by direct front attack.

ROAD-MAKING.

The descent from the pass into the elevated valley of Mastura (some 1500 feet higher than the Khanki, and not so much as 700 feet below the pass) was short and comparatively easy. The difference in elevation was at once apparent in the general appearance of the landscape; and the first view of the valley, as one rounded the last corner of the spurs enclosing the downward path, was most striking. It was not late enough in the season, even at this elevation (about 5900 feet above the sea), for apricot trees and walnuts to have parted with the glory of scarlet and yellow with which autumn had touched them; and each homestead and village piled on to mountain crag, or perched on the plateau high above the river, was embedded in colour. There were scores of such villages. Wherever a few houses were massed together in sufficient number to justify a name of their own as a separate village community, there a square-cornered but tapering tower dominated the little crowd, standing up picturesque and graceful against the sky as a Persian minar or a Florentine campanile. The beauty of the Mastura valley is the cultivated beauty of the higher Swiss valleys rather than that of Kashmir or the Himalayan Alps. Six thousand feet of elevation lifts it above the dust-begrimed atmosphere of Khanki or Meranzai, and associates it with visions of western mountain beauty.

Regretfully leaving the pretty Mastura valley by a wide upland valley which trends a little west of north, but which was seamed and intersected (as usual) by deep ravines, we soon faced the Arhanga—and the Afridis. In spite of special reports from native sources to the contrary, I doubt if the Afridis had given much previous support to the Orakzais, either at Dargai or Sanpagha; but to explain my reasons would be an inadmissible digression. It is sufficient to say here that we saw very little indeed of them at Arhanga. If they were there in any numbers, they succeeded exceedingly well in hiding themselves. Once again Nature had planted a convenient hill facing the pass from the valley below at effective artillery range. No "sangars" were observable on the pass or on the dominating peaks overlooking it, and no solid obstruction was made to our advance.

Descending about 1000 feet from the Arhanga pass to the Maidán plain (which is approximately on the same level as Mastura), the first impressions gathered of the Afridi paradise are disappointing. The picturesque beauty of Mastura is wanting, and there is no immediate prospect of smiling valleys teeming with cultivation and watered by rippling streams such as the Afridi is wont to describe when speaking of his ancestral domains. Barren, brown, and sterile hills shut in the narrow roadway, and the ultimate outlook, as one peers through the end of the defile towards Maidán, is one of further brown and barren hills, with a triangular section of dust-coloured plain at the foot of them. Nor even when one turns the corner after a mile or two of descent, and after crossing the deep-set river flanked with steep terraces, climbs up again on to the general level of the Maidán platform, does the full significance of the landscape, hachured with close-set parallel lines of field revetment, and dotted with round trees, strike one with any overwhelming force. The Mastura valley, with its graceful watch-towers and villages, and its grey limestone cliffs broken with black blotches of olive, appeals far more to the sense of affluent beauty than does the historic "Maidán." Indeed, I have heard the latter frequently classed by the British subaltern (who is nothing if not comprehensive, and whose powers of observation are often superficial) as a "ghastly hole." Later on, the occurrence of a few ghastly incidents might have better justified the epithet; but at first it required a little careful observation to become aware of the extraordinary resources in fertility that Maidán possesses.

Maidán is an oval-shaped valley about 7 to 8 miles long and from 3 to 4 miles wide, including all cultivable slopes to the foot of the surrounding hills. From these hills centuries of denudation have washed down detritus, which has collected in the centre of the valley to an unusual depth. Judging from what one could see by the sections formed in the central river-beds, there may be deposits of 100 feet of alluvium in some parts, gradually thinning out towards the edges of the basin. Ten feet of excavation, within the limits of the camps at Maidán and Bagh, revealed nothing but deep beds of rich loam, the crop-producing qualities of which must be enormous. The outlet from Maidán, through which the drainage of the valley passes to the Bara river, is exceedingly narrow, running near Datoi into a defile (locally called Khrappa, from the scrunching noise made by walking along its

COMPLETED ROAD, SHOWING ALTERNATIVE LOOP.

pebbly bottom), and turning abruptly, almost at right angles to the length of the valley, after it has cut through the northern hills near Bagh. The heads of the main stream spread like a fan through Maidán upwards from the Bagh opening; and it is probably due to the abrupt twist that they all receive when uniting below Bagh, that the denudation of Maidán, by the conveyance of the soil in the form of silt to the Bara river, is prevented. Thus the wealth of cultivable soil in the Tirah Maidán is rather enhanced than diminished by the yearly floods. All the drainage lines converging from the rim of the oval Maidán basin on to the Bagh opening, cut deep into the slopes of the foothills, hollowing out for themselves a waterway which deepens in the centre of the valley to 200 feet or more. The sides of these waterways are precipitous and almost impassable near the hills, but as they enter the plain they are frequently let down by terraced steps for the purposes of cultivation, which renders them somewhat more easy to negotiate. Between them are long tongues of sloping plateau drooping away from the hills towards the Bagh centre. These are never very wide, but they are terraced, levelled, and dressed into the highest possible form of irrigated cultivation. Never, either in Afghanistan, Baluchistan, or Persia have I seen an equal area so highly developed as the Tirah maidán, excepting perhaps the Chardeh plain near Kabul. Every inch of cultivable ground is utilized. On the plateau above the river-beds, one looks across a seemingly level expanse of brown plain, with trees and houses scattered in irregular patches, and every apparent facility for inter-communication. Yet without carefully directing one's steps in the one possible direction, it is difficult to move for more than a few hundred yards without encountering a steep declivity, and becoming at once swallowed up by the narrow depression of a ravine-bed. Once down in the depths of these ravines, any action that might occur on the hills or plateau above was completely lost to sound and view—and the Afridis were only too well aware of this fact. To our unwary soldiers, there was every appearance of excellent cover about these lines of retreat from the hills; to the mobile Afridi, they were just the right sort of trap to hold his enemy till he could reach him from the overhanging banks.

In the late autumn, when once the yellow leaves of mulberry and walnut have disappeared, the general aspect of Tirah is that of brown sterility. The briar and rose hedgerows take on a copper hue, and in November there was all the usual appearance that the frontier assumes when about to wrap itself in its white cloak of winter snow. The delicate tracery of trees was lost in a monotonous, dust-coloured haze, so that one could hardly appreciate the numbers of them that surrounded each homestead. There are many magnificent walnut-trees, and the mulberry and apricot flourish with a true Himalayan development; there are wild olives and pomegranates on the hillsides, and the blue pine (*Pinus*

Excelsa) covers their cliff-bound summits; but on the whole Maidán is sparsely wooded, and it is a matter of surprise that so much timber is found for use in the construction of their houses. These houses are generally square-built, flat-topped, two-storeyed erections of wood and mud, which (but for the obvious necessity of importing timber from the Sufed Koh) are readily run up, and as readily destroyed. It is not worth the while of any Afridi to display a sense of superiority to the rest of his clan by any pretensions in the matter of a summer residence. His pretensions could be so very readily removed. The mullah, Saiad Akbar of Warán, had perhaps the best house that Tirah boasted. It was partly built of stone, and it was partially demolished on our first visit to his valley; but in the short interval that elapsed between that first visit and the second (only a week or two), this house was already well on its way to restoration. At the second time of visitation not much was left of it. It is a curious fact that in a country where tribal factions are rife, where raids and counter-raids are periodic incidents, and no man can boast of a house that is more than a few years old, individuals do not collect in communities and place themselves behind walled enclosures, dominated by watch-towers, as is customary in other countries where similar idiosyncrasies prevail. But Afridi habitations exist far more generally in the form of separate homesteads than as village groups. With the first general glance over the Afridi Tirah, the eye is caught by its quaint resemblance to a city suburb teeming

GENERAL VIEW OF TERRACED COUNTRY.

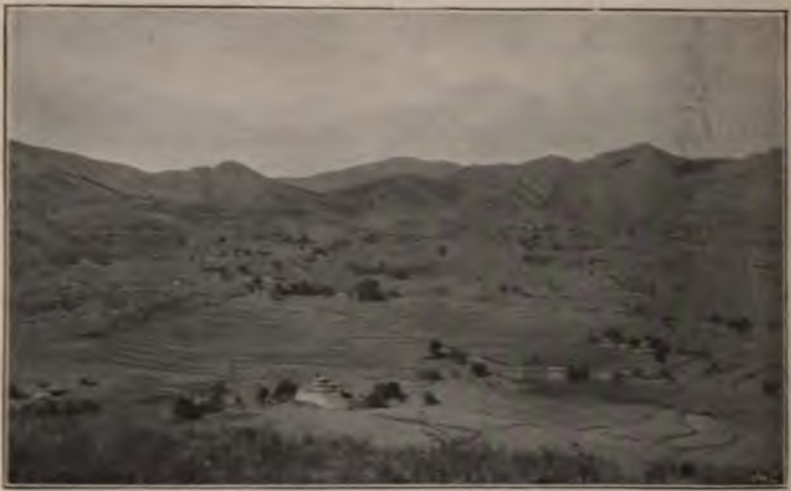
with detached villas and enclosed gardens, very different indeed to the close-packed villages of the plains of India, or the walled enclosures of Afghanistan, and far more suggestive of the peaceful conditions of rural life than of a perpetual necessity for self-defence. Yet we know that there is no transfrontier district between the Arabian sea and the Black mountain where a householder has to tread more warily, or keep more constant watch and ward on his neighbours' proceedings, than in Tirah. This profusion of small homesteads and farms leads at first to an impression that Tirah must be very thickly populated; and it is also conducive to much confusion of names of localities. Every separate house or block of houses has the owner's name attached, often in addition to some local designation. Even where houses are massed in numbers sufficient to denote a village, it is the name of the headman of the community, rather than the definition of any local peculiarity such as would carry a lasting significance, that is attached thereto. Such names as Bagh, Dargai, Khrappa, Datoi, etc., which indicate topographical peculiarities, and which are likely to recur as often as the peculiarities they represent recur, are only applied to habitations when the habitations happen to fit themselves to the topographical features; and even then it will usually be found that the ruling Khan's personal name is more readily recognized than the local appellation. Bagh denotes an orchard or garden; it is a name which acquired some significance from the fact that it was at Bagh that the tribal jirgahs were held, and it figured in local reputation as a sort of capital to Maidán. But we found nothing at Bagh—nothing but a few insignificant fruit trees—to justify the name; no permanent village or bazaar, nothing to indicate the central capital of a flourishing district, beyond a flat-roofed, mud-plastered shed supported on wooden posts, on the top of which the Country Council was wont to assemble. Bagh is only a convenient central position for meeting, affording no special advantage in position to one Afridi clan more than another. In all Maidán there is no single dominating village, or town, which could be considered as a trade centre, or give commercial pre-eminence to any particular clan.

The cultivated area of the Afridi Tirah is divided between the chief clans roughly as follows: the valley of Maidán is occupied chiefly by Zakka, Malikdin, and Khambar Khel, and there are other small clans in the high valleys to the west, which are unimportant; the Waran valley, which lies to the east of Maidan and connects it with the Mastura valley, is held by Zakka and Akka; the Rajgul valley, which lies between Western Maidan and the Sufed Koh range, and which forms one principal head of the Bara (Maidan itself being the other), is inhabited by Khuki Khel; whilst lower down the Bara (after the junction of the Rajgul and Maidan drainage at Datoi), we get Kamar, Sipah, and then Zakka Khel again, and the latter spread through the Bara valley into the valleys of Bazaar and Khyber north of Bara. Thus, the Zakka possess territory which stretches from the Orakzai Mastura on the south, right across Afridi land to the Khyber on the north. They are, therefore, the only section of the Afridis who can command a right of way from their summer headquarters in the hills to the plains of India without passing through the tribal limits of any other section, and they possess, moreover, peculiar facilities for retirement across the mountains into friendly Afghan territory, when reduced to this manœuvre by stress of circumstances. It is this fact, combined with their relative commercial strength, which gives the Zakkas a lead in the councils of the Afridi Khel, and renders them exceptionally difficult to coerce by military methods.

TERRACES IN MAIDÁN.

The difference between the system of defence adopted by the Orakzais and that of the Afridis, is indeed due to the difference of geographical position in the two countries they occupy. Both districts abound in narrow, tortuous, and precipitous defiles, flanked by boulder-covered hills, the steep slopes of which are impracticable to the untrained British soldier, and are difficult enough for native troops; but which can be traversed by the hill-bred tribesman, untrammelled by extra kit and well acquainted with every goat-track and by-path winding and twisting through the labyrinth of crag and forest, with a facility which seemed at times to be almost supernatural. In both districts there is cave-shelter to be found in the broken mountain wilderness, which might be sufficient to afford a temporary home for women and children turned out of their homesteads in the valleys by the pressure of invasion, but it is a protection that barely shelters them from the rigors of winter—from blinding blizzards, and from sweeping snowstorms, and the mortality amongst them would inevitably be great before spring set its seal of warm vitality on the country again.

But there is this difference between the Orakzai and the Afridi Tirah. The Orakzai possess no better refuge than may be found in their own hillsides, and they must perforce capitulate when these hillsides are rendered untenable by stress of winter. The Afridi, on the other hand, has a safe harbour of refuge in the Afghan valleys to the north of his country, with an open back door, or series of back doors, through which he may retire across the Sufed Koh watershed to the lower slopes of the range where the Shinwaris dwell on the skirts of Ningrahar. Here, being rich with rupees collected from Indian subsidies during many a long year of peace, he can pay for board and lodging, can plant out his wife and family, can recruit his energies, and emerge again to fight when time is called; unless, indeed, he first quarrels with his Shinwari entertainer (which would be the natural sequence of his visit) or runs out of cash. Thus, hunting the Afridi in his native wilds with an army corps is like hunting rabbits in a warren with a pack of hounds before the earths are stopped. There can be no immediate practical result. The existence of the army corps may be, however, amply justified if its moral influence makes towards the closure of those back doors, which chiefly inspire the spirit of defiance, and form the backbone of Afridi resistance.



SHOWING THE SCATTERED NATURE OF THE TIRAH VILLAGES.

The fighting strength of the Afridi clans has been hitherto largely over-estimated, the basis of all estimates having been the accounts which they have rendered of themselves. Information obtained in this way is never very trustworthy, and a far surer method of calculating their strength lies in accurate measurement of their cultivable lands, and an estimate of its capacity for supporting population. By far the finest area of crop-producing soil which the Afridis possess is the upland valley of Maidán; yet the whole cultivable area of Maidán does not exceed twenty-five square miles, and it is doubtful if the Upper Warán, the Bara, Bazaar, and Kyber valleys combined could together contribute another twenty-five. It is true that this area is developed to its highest possibility for the growth of cereals (chiefly wheat) in Maidán, and of an exceptionally fine quality of rice in Bara, and that it is densely populated for a trans-border district. Money has been pouring into Afridistan during twenty years of peace. Every discharged sepoy has taken home his little pile. Eighty-seven thousand rupees a year have passed through the hands of the Khyber rifles, and as much again has been paid in subsidies. This wealth has largely affected the development of agricultural interests (as well as contributed to the purchase of long-range rifles and ammunition), with the result that the Afridis may well be classed as the richest, best-armed, and possibly also the most prolific of border tribesmen; but the small extent of cultivable lands compared to the unproductive wilderness of barren hills must be reckoned with in estimating their numbers. If we put the limit of land occupation at 300 per square mile for the cultivated districts, this is probably the highest estimate permissible from such inferences as could be drawn by actually counting

MAIDÁN TERRACING.

villages and homesteads. This only gives us a population of 15,000, all told, for the agricultural districts; and although there may be a floating nomadic population in the hills, the estimate of whose numbers is not to be based on their visible possessions, I should doubt exceedingly if they amounted to 10,000 more. Twenty-five thousand men, women, and children will not admit of a larger contingent than 7000 or 8000 fighting men, and this I estimate to be their full strength. A large majority of these must pass through our ranks, where they learn (being an exceptionally intelligent people) a great deal more than the mere use of their weapons; and amass money enough for that consummation dear to the heart of every Afridi, the purchase of a good rifle. The experiences of the late Tirah expedition certainly did not justify any larger estimate of their numbers than that given. At Dargai there were but few Afridis opposed to us. It was essentially an Orakzai engagement. At Sanpagna and Arhanga the numbers actually seen could be reckoned in tens. In Maidán there was no single engagement in which the enemy showed *en masse;* and in Bara their numerical inferiority was denoted by the fact that they were obliged to concentrate their forces entirely on the route taken by the second division, leaving the first division to pursue its march unopposed through a labyrinth of defiles, such as might have been effectually defended by a few score men.

The character of the Afridi presents, at first sight, a problem involving such a hopeless mass of contradictions, that we must study the conditions under which the Afridi lives in his own country to account for his extraordinary idiosyncrasies and intertribal customs. Family blood-feuds, and the absence of any central autocratic authority, accounts for much in a country where every man is a law unto himself, provided he is strong enough. Thus it happens that, combined with a deadly intertribal vindictiveness which, in his eyes, justifies any sort of treachery, and an apparent total disregard of conventional forms of honour and integrity when carrying a blood-feud to its conclusion, there certainly does exist an underlying and crude, but sufficiently real, sense of honour, which will keep an Afridi true to his salt under the most aggravating conditions. As an instance of this intertribal vindictiveness, I shall never forget the determination shown by a Malikdin clansman, who was my guide in Tirah, in demanding the destruction of certain Zakka villages. He even appealed to the chief of the staff personally, when he observed that the village of a Zakka chief of some small note had been accidentally left untouched amidst the general destruction which had fallen on the country, and that it was in danger of escaping scot free.

A story was told in camp of an Afridi who was questioned as to the value of the weapons he carried, amongst which was an old and obsolete pattern of pistol, which possessed no merit beyond its power of scattering destruction at close quarters. He admitted that it was out of date, but he added that, useless as it might be for purposes of actual warfare, he reckoned that it *was a most efficient weapon in a jirgah.*[*] They all, however, complain bitterly of the evils which have followed the introduction of the long-range rifle into their country. Formerly, a man who was at blood-feud with his neighbour could at least till his fields by daylight, keeping one eye open to the possible chances of a shot fired within visible distance. Now, they say, it is quite impossible to tell from whence a bullet may strike, and the only safeguard is to take to agricultural pursuits by night only. Born and bred in such an atmosphere, it is no matter of surprise that an Afridi should be steeped to the chin in all the arts and wiles of tribal and domestic treachery. It is rather astonishing that he should ever possess the soldierly quality of faith to his colours and his salt at all, and should reserve the brutalities and treacheries of his bandit existence for his own tribe and his own hearthstone. But we have had no cause to quarrel with the Afridi on this score. What he has done for us has been well done. It was an Afridi company that went to the assistance of the 35th Sikhs, on a memorable occasion when they were too closely beset by Mahmunds; and the defence of Landi Kotal, where Afridi fought against Afridi, with no intervention on the part of British officers, was quite good enough to

HOUSES IN MAIDÁN.

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[*] A *jirgah* is a friendly meeting in council of the headmen of different clans for the purpose of discussing intertribal affairs.

warrant our faith in his allegiance so long as he is led by his recognized leaders.

The system of hereditary blood-feud, handed down from father to son, and imposed on successive generations long after the original cause for quarrel has been forgotten, or its bitterness modified by time's intervention, leads to a peculiarly open-minded condition of feeling between the Afridi and his enemy. Personal animosity seems to be wanting either in his attitude towards an hereditary individual foe, or towards a national enemy. As an instance of the former, I can recall an occasion when I was closely associated with a distinguished frontier official in Turkestan, and the nature of our investigations led us together far afield where we were much dependent on the support of our escort and servants both for our comfort and safety. The escort was small, and servants were few, and it was chiefly to our two orderlies, both Afridis, and both drawn from the same regiment, that we looked for all those various services on the road, without which we should have had anything but an easy time of it. Every frontier officer knows the value of a good orderly. They followed us from early dawn to sunset. They rode together and assisted each other in the duties of camp life. They helped each other out of difficulties. On one occasion I remember that one of them, dishevelled and soaked, was fished out of a river, where he had lost his depth, by the kindly extension of a pugri, unwound and thrown to his assistance by his brother sowar. When, in due time, our journey came to an end on the borders of India, my orderly came to me with a complaint, and the burden of his grievance was as follows: The other orderly, his Afridi relation, had had the opportunity of visiting a far-away Persian town with his master, where, with the accumulation of his regimental pay, he had purchased a most useful and far-searching rifle. I asked my friend what difference that might make to him; and he explained, with great candour, that it might make just *all* the difference. They two had yet to settle an ancient blood feud, and one of them had to die. He did not wish it to be himself if he could help it. I was obliged to regret that I could not support his bloodthirsty intentions, or recognize the necessity for arming him in such a cause, but I did not think it an altogether misplaced token of my regard for his excellent services, and my real goodwill towards the man himself, to give him a handsome present, although it could not take the form of a rifle. At the bottom of my heart I *could not help* wishing him success, he was such a good fellow. And yet I knew the other man to be a right good soldier too. It was an awkward dilemma. As for dissuading them from their intentions, such interference would have been regarded as a contemptible effort to effect a breach of Afridi honour, and I should certainly have been suspected of a spirit of meanness unsuited to an officer and a gentleman. I never saw my friend again. He has joined his fathers, and lies with many generations of victims who have been sacrificed to a national sense of what is due to the spirits of an acrimonious ancestry. One good soldier slew the other on the first opportunity that presented itself, without animosity, and without remorse. As for their national feeling of vengeance against the British for swarming through their country, destroying their homes, and laying waste the fair places which they so love to talk about, it is perhaps best gauged by the fact that long before hostilities between us were concluded there was a demand for admission into our ranks as recruits—greater than any that had ever previously been known. The Afridi is treacherous and cruel (as we measure treachery and cruelty) by heredity and by education, but he certainly does not deserve all the hard words cast at him by McGregor and other frontier authorities. He is intelligent—by far the most intelligent of all frontier tribesmen—and compared to the loyal but obtuse Sikh, he is a man of quite monumental intellect. He will learn anything readily that he is set to learn. Afridis are not, for instance, a people bred up to horsemanship and riding, but they rapidly develop into most excellent horsemen in the ranks of our cavalry. Our teaching has turned the Afridis into soldiers who not only know the use of their weapons, but who have shown that they possess that quality the want of which has been our great security amongst the fighting hordes of Northern India, the quality of combination and the power of leading.

NEAR ARHANGA PASS.

The Afridi is a Pathan; but what this implies; what his relations are with the Afghan; who the Pathans themselves are; and what generally is the nature of that strip of independent territory which he inhabits together with those other turbulent tribes who have lately given us so much trouble,—all this requires a few words of explanation, which I will endeavour to render as short as is consistent with clearness.

Afghanistan, to begin with, is a name which we have applied to the kingdom ruled over by the Amir. It is not a geographical term recognized by Afghans; it means "the country occupied by Afghans." But this is not an accurate definition of Afghanistan, for that country is peopled by a conglomeration of tribes of mixed nationalities, originally drawn from nearly every corner of Asia, amongst whom the Afghans are merely the dominant race. And just as Afghanistan is not the territorial designation recognized by Afghans, neither is "Afghan" the ethnographical distinction chiefly in use amongst themselves. They call themselves "Duránis;" and, above all things, they claim to be the true Ben-i-Israel, the descendants of those people whom Nebuchadnezzar took captive and carried off from Syria to Babylon. How far ethnographical researches confirm this tradition we will not stop to inquire; but it is well to remember that the Afghan claims to be of Israelitish descent, and to be a member of the great Durani clan—the clan that once ruled an empire.

But, again, the habitat of the Afghan is not confined to Afghanistan; he occupies a very large section of that strip of independent territory, buttressed in between India and Afghanistan, which we call "independent." The Mohmands are Afghans; so are the Yusufzais of Swat and of Boner. Now, all Afghanistan and all this independent country were, about a quarter of a century ago, part and parcel of one great Durani empire. This the Afghan never forgets; and there is, consequently, the strongest possible tie of brotherhood, based on the record of a grand history, to say nothing of the ties of religion and of common language, binding together the whole Afghan community into one, whether it be located in Afghanistan or in independent territory. The Amir is still their religious chief, their Prince of Islam, their actual Durani king, whether they admit his direct control or not.

So much for the Afghan. The Pathan is simply a man who talks the Pushtu language—consequently all Afghans are Pathans; but, besides Afghans (and far outnumbering them), is all that vast collection of tribes of Indian and Central Asian extraction which inhabits, not only a large portion of Afghanistan, but a large section of our independent "buffer" states as well, and who spread even into the Peshawur and Kohat valleys, speaking the same widespread tongue, and acknowledging such affinity as community of language implies. Thus all the frontier people (including Afridis) with whom we have lately been engaged on the north-west frontier of India are Pathans; and what we have to observe is, that all the people who live in

Afghanistan, and all the people who live in this independent section of mountainous country intervening between Afghanistan and India, are bound together, first, by the strong tie of religious feeling and sympathy, and next, by community of language; whilst amongst the true Afghans (who form the dominant tribal community) there is the added tie of kinship in the Durani brotherhood, and in the faith that they are God's chosen people sprung from the seed of Abraham.

But those who have lived and moved amongst these frontier people will tell you that this bond of sympathy is by no means all-embracing; it sets most strongly in the direction where reciprocity of feeling tends to practical advantages (as is the case, indeed, all the world over), and that this gain of practical advantage is most obvious from the direction of Kabul. The Afridi cares no more for the interests of his Mohmand Pathan brother than he cares for those of the Esquimaux; but he cares greatly, and they all care, for the friendly backing of their great spiritual chief, even while claiming temporal independence. Should tribal *jirgahs* fall out and fight, then arbitration between them is to be sought at Kabul; should the Feringhi exhibit a tendency towards the adjustment of boundary-lines, then is intervention to be demanded from the Amir; should a too-venturesome tribal chief fall into the strait places involved by defeat and disgrace, it is to Kabul that he will resort, and there his woes will be poured forth into the attentive

MOUNTAIN SCENERY, TIRAH.

ears of Kabul's king. There, too, will he usually find a safe harbour of refuge until the tyranny of the Feringhi be overpast, and he can emerge again with the view of making himself as unpleasant as circumstances admit.

Thus have the Amirs of Kabul always exercised a very real influence in these border districts, which they have never conquered, and which claim independence; and it is small wonder that, from the days of Dost Mahomed downwards, they should have secretly regarded all Pathan subjects as their own, and occasionally, with no attempt at secrecy, have asserted their claim to Peshawur itself. The British Government has, however, insisted on the independence of these tribes being a real independence by the construction of a boundary between them and Afghanistan. It has been a costly process, for our motives have been misinterpreted; but the net result is the creation of a new geographical feature in a mountainous borderland which is neither Afghanistan nor India, but which includes a great part of the province known to Afghans as Roh, containing those independent tribes (Rohillas) of whom the Waziris, the Afridis, the Mohmands, and the Swatis are amongst the chief. On the one side is the recently demarcated boundary, which is the boundary of Afghanistan; on the other is the boundary of India, which (with many important modifications) is still the boundary which we inherited from the Sikhs when we conquered the Punjaub. It is with the Afghans and Pathans generally that lie between the two that we have to deal in future, and the method of dealing with them is still a perplexing problem. Most interesting of all these tribesmen to me is the Afridi, for he is much the most advanced. He is a Pathan of Indian extraction. There are indications in his own traditions, and in his personality, which point to a Brahmanical (possibly Rajput) origin. He is distinctly wanting in fanatical fervour, and is, on the whole, but a half-hearted Mussulman, listening only to the seductive voice of the mullah when the teaching of the latter jumps with his own love of fighting. It is naturally amongst those clans that furnish the fewest recruits to our ranks, that the greatest ignorance (and consequently the greatest faith in the ignorance of their mullahs) prevails. The Zakka are pre-eminently the "wolves" of the community, and our worst enemies; and they are so regarded by the better-educated clans around them, by whom they are, as a matter of fact, detested. Even they have, however, learned the use of the long-range rifle, and know how to combine against an enemy, and it is probable that they would be able to overwhelm all the other clans put together if left in possession of their rifles, whilst others were disarmed. It is this which makes disarmament of the smaller clans impossible without impartial pressure being brought to bear all round. Between the Afridis and ourselves a good deal has been lately taught and learned. They have learned that we can make good our right of way through any country, however difficult and however well defended. They have lost that sense of security and that moral support which the existence of well-assured means of retreat always gives to the frontier fighting man, and they have learned therewith the useful lesson not to "put their trust in princes." On the other hand, they have taught us something of the nature of that new phase of transfrontier military existence, which is rapidly developing on our borders, *i.e.* the existence of people brave and warlike (as, indeed, they have ever been), becoming daily better trained and educated in military science, armed with weapons as good as ours, and just beginning to feel their way towards military combination under experienced leadership. All this puts an entirely new complexion on our little frontier fights of the future (for we cannot disarm them), and disposes most effectually of the argument that because a quasi-police system of reprisals has answered for the last fifty years, it should answer equally well for the next fifty. Nothing stands still in the evolution of time, certainly not the military development of the Afridi, the Swati, the Bonerwhal, the Afghan, or the Wazir; and it is probable that after recent experiences even the Baluchi will understand that a small, well-armed, and well-disciplined force is not to be annihilated by a mob, however brave. If we have purchased our recent experiences in Tirah somewhat dearly, we have at least secured much matter for useful reflection. Like the man in the fable who created a tiger, we have now to consider what to do with our own creation. But that is not a geographical problem.

Just a few words about the geographical results of the recent frontier expeditions, to which the survey of Tirah was a useful contribution, although it represented but a minor part of the total out-turn. Whatever may have been the real nature of that independence on which the Rohillas (a useful ethnological term as applied to the hill men who occupy this frontier province of Roh from the Indus to the Sulimani mountains) so love to dilate, it has, at any rate, hitherto acted as a severe check on the progress of border surveys. Of Afghanistan and Persia we now know a great deal, and of Baluchistan we know everything geographical, but these borderlands immediately adjoining our own frontier have, from the Suliman hill northwards, only been approached by the surveyor under cover of a military expedition, or else have never been approached at all. Thus it happened that up to this last year of 1897 we actually knew less of that which concerned us most in our immediate neighbourhood, than we knew of those further trans-frontier countries which lay beyond the new boundary of Afghanistan. Boner, Swat, the Mohmand country, the Tochi valley, with a good slice of indefinite border country north of it, have all now delivered up their geographical secrets, besides Afridiland; and a new survey has been secured of the Khyber pass and its neighbouring hills, which was much wanted. It will be remembered that the latter was surveyed during the Afghan war by that most energetic surveyor, Mr. G. B. Scott, who found himself more than once in hot collision with the tribes-people, and could only accomplish a rapid sketch of all the principal positions. New schemes for defence, water-supply and communications have demanded more exact surveys, and these have now been made.

It is only fair to refer to those officers who (well backed up by a contingent of native surveyors) have accomplished all this, and have effected a clean sweep of all remaining *terra incognita* that fringed the north-west border of our map of India.

In Boner and Eastern Swat, Captain C. Robertson, R.E., has made his name great as a surveyor and mountaineer, and his hereditary artistic talent (for his father was one of our best-known painters of Eastern subjects) has turned out maps which for beauty of finish will be standing examples of what can be done by a true artist even in the rough field of a campaign. Captain Robertson will certainly be heard of often in future fields. In Western Swat and the Mohmand country, as well as in the Kyber and lower Bara valleys, I was indebted to that well-known surveyor, Major Bythell, for a large extent of valuable mapping. Major Bythell is also an artist; but he, like my old friend Colonel Wahab (who assisted me on the Kuram side of Afridiland, and who has taken over my duties in India for the future), has already won his reputation in so many fields that I can add little more than my thanks to them both. Tochi was negotiated by a young staff corps officer, Lieut. Pirrie, whose only grievance seemed to be that his field of action was not quite big enough for him. However, there is a large world yet awaiting further survey developments, and there will be room in it for all his future energies. On my own personal staff in Tirah I had the invaluable services of Lieut. G. Leslie, R.E. (now Major Leslie), and of Lieut. Holdich of the Cameronians, both of whom were untried surveyors, but both showed a marvellous aptitude for the business part of the proceedings, especially when the plane-table went to the front. With their assistance on the field of action, I was able to leave much of the surveying along our line of route in the trustworthy hands of my old civil assistant, Mr. E. A. Wainright. With these officers there was, of course, associated a small but most efficient staff of native plane-tablers—mostly old soldiers, and drawn from a variety of regiments and classes, but all of them old hands at surveying and practised draftsmen. A Yusufzai Pathan and a Sikh both distinguished themselves greatly by their energy, their skill, and their daring; but it would be difficult to say that others were not almost as good as they. It was always more difficult to persuade these men to retire when the hostile Afridis closed on them whilst at work, than to ensure their obedience to any other order. The plane-table lost a foot in action, and was otherwise injured; but a kind fate preserved the surveyors throughout the campaign, and no member of the party was the worse for it.

For perhaps the first time in these frontier expeditions, the plane-tabling had to be carried on with the fighting line, and triangulation (which necessitates going far afield and visiting high places) had to be abandoned. Fortunately, previous surveys north, south, and east of Tirah had left a legacy of surrounding points which were just enough to carry us safely through our topography. The plan of action was much the same all the time we were in Tirah. With the earliest movement of any troops leaving camp on a reconnaissance in force or for foraging purposes, as the case might be, the little plane-tabling party was in the field. And here I must make my acknowledgments to that splendid body of hill workmen, the Ghurkha scouts, for they frequently safeguarded the surveyors through a difficult day's work. Careful training in the hands of their leaders, Major Lucas and Lieut. Bruce, had fitted them for work in which no untrained troops could possibly compete with them. They swarmed up the hills with all the agility of mountain cats (or Afridis), and once up, they spread out under cover right and left, and kept the Afridi sharpshooter at bay with all the science of old shikaris, and all that genial delight in the fun of the thing that only a Ghurkha betrays. Meanwhile the plane-tabler plodded away at his work behind them. When, however, the shooting gradually got closer and hotter, and there was danger of being intercepted on the return journey, the order was given for the klassie who carried the plane-table, to start. He was allowed a free run downhill in advance, to compensate for being handicapped with the instrument, and he usually went at his best pace. When he was far enough ahead, the word was passed round for the scouts to retire, and the race after the plane-table became general. I believe it was a fine sight, and I regret that personally I never participated in the movement. I believe the Afridis usually gained a little (but not much) on the Ghurkha, but the pace was too good to admit of any refined accuracy in shooting; and, so far as I am aware, the retirement to cover at the foot of the hill was always effected, if not gracefully, at least with perfect success.

Before reading the paper, the PRESIDENT said: We now have with us at last our old friend Sir Thomas Holdich, to whom I feel sure you will all give a very cordial welcome. He is going to give us an account of that region which was, I may say, discovered and explored by himself and his surveyors when serving in the Afridi Expedition under Sir William Lockhart. I may add that Sir William Lockhart himself has expressed to me his very great regret at not being able to be present this evening. I will now call upon Sir Thomas Holdich to give us his paper on Tirah.

After the reading of the paper, the following discussion took place:—

Sir JAMES HILLS-JOHNES: It is very kind of the President to ask me to pass some observations. He knows well that I have seen a little of that kind of country, but nothing to equal the very rough ground that has been gone over by Sir William Lockhart and his troops. Sir Thomas Holdich has explained to you in a very clear manner the difficulties he has had to encounter and the style of country he has gone through, and I do not know that any words from me can be of use to further explain what he has so clearly told us about the country. He has also enlightened us as to the difficulties of the route, the absolute want of roads, and the large amount of transport that had to be taken, causing thereby the great difficulty of the campaign. I am surprised and pleased to hear that the troops did not suffer so much from cold as one supposed they would. What he has told us, that the temperature at night was hardly less than that of day at those cold and barren heights, is very remarkable. I congratulate Sir William Lockhart and the forces who have gone through that country and held up the name of the British troops in the way they have done. The native troops have shown themselves to be equal to Britishers, and I heard the lecturer say that the wonderful behaviour of the Ghurkhas was something quite extraordinary and much to be lauded. He also praised all the native troops. Of course, we expect the British troops always to do well, but those who do not know what the native troops are must be astounded at the excellent way in which they perform their duties. Left alone by themselves with native officers, they did what could hardly be expected of them to do, and I can only finish my remarks by saying that we congratulate Sir William Lockhart in having such an excellent staff and such persevering survey officers as he had—Sir Thomas Holdich and the officers under him. He informed us of the able assistance he received from the native surveyors under him, men from the native army—Afridis, Afghans, Sikhs—and I hope what he has recommended we will follow up, and that is that we should employ those men in other countries. They are men who can go where Europeans cannot go, for they need carry very little food with them, and they are hardy and well-trained men. I congratulate Sir Thomas Holdich for the excellent lecture he has given us; I am sure I have heard no better lecture in this hall.

The President: Sir Thomas Holdich has certainly given us a most interesting account of these valleys, which were previously quite unknown, and he has also given us much food for reflection in many ways. We should have expected that all these valleys, which lead to passes over the mountains, would have become known to us in early histories, through their having been traversed by one or other of the invaders of India. But it appears that the passes about Tirah did not attract any of them, neither Alexander, nor Mahmud of Ghazni, nor Baber, nor Ahmed Abdallah; they all selected easier routes. Of course, this is the reason why, both in native history and in the work of our surveys, these valleys have hitherto remained unknown. They will now be somewhat different from what they were before they were invaded by an English force, for English troops never go anywhere without leaving some good behind them. These valleys are now covered with excellent roads, which will certainly be used and carefully kept up by the Afridis. I think our admiration is due, as Sir James Hills-Johnes has reminded us, to Sir William Lockhart, for the admirable manner in which he conducted this campaign. He is a very old friend of mine, for I made his acquaintance more than thirty years ago, at the very time that I had the pleasure of making the acquaintance of Sir Thomas Holdich. To Sir William we owe the means which were given to Sir Thomas Holdich and his surveyors of mapping out and making us acquainted with this interesting region. We have to thank Sir Thomas Holdich for very much more than this. Ever since I have known him, he has been working in the cause of geography; and his services have been most valuable to this Society. I remember that Sir Henry Rawlinson was in this chair when Sir Thomas sent home his remarks on the Afghan campaign, he having mapped upwards of 30,000 square miles. I listened to the interesting discussion that was joined in by Sir Henry Rawlinson, Sir Henry Yule, and Sir Richard Temple. Three other valuable papers were sent to us when he was engaged on the Afghan boundary commission. The last was read by our lamented associate, General Walker. We owe a great deal more than this to Sir Thomas Holdich, for he has kept us regularly informed of the work done in India. He has also kept us informed of the valuable services of the men who worked under him, whether natives or British, and has thus enabled us on many occasions to show our appreciation of their work; for all this the Society has to thank Sir Thomas Holdich. But we have now more especially to thank him for the admirable paper he has just read to us, and I am sure you will pass a vote of thanks to him with unanimity.

KAVIRONDO.*

By C. W. HOBLEY.

PHYSICAL.

An observer obtaining a bird's-eye view of Kavirondo from the southern slopes of Mount Elgon would essay the opinion that Kavirondo was a large flat grassy plain, only relieved by a few insignificant eminences and rocky tors. But upon descending to cross this plain, he would find that every mile or so his progress would be checked by valleys of considerable magnitude and of different degrees of steepness, each with its running stream, and each stream with its strip of boggy, reed-clad land on either bank. The country is, generally speaking, magnificently watered, for, apart from the stream in each valley, tiny springs are often found halfway up the sides of the valleys.

In the neighbourhood of the lake, however, a different condition of things prevail. A strip of country about 15 miles wide, and parallel with the shores of the lake, is characterized by extreme aridity, due to a deficient rainfall; the watercourses are dry, grass is a rarity, and the typical vegetation is of the aloe and euphorbia tribe. Nearly the only water in this region is that of the Victoria Nyanza, and on this account one is not able to explore the place with ease. In many places it was found that the villages of the natives were situated as much as 5 miles from the lake, and every second day a long string of women set out for the lake, bearing huge waterpots, to fetch this necessary of life.

In addition to the aridity, parts of Usakwa and Uyoma are frightfully stony in some places; one wonders where they find the soil wherein to plant their crops. This class of country, however, forms a very small proportion; the bulk of the country is capable of maintaining at least ten times its present population.

The district may, for present purposes, be said to be bounded on the north by Mount Elgon, to the north-west by the Elgumi country and Usoga, on the west by the Nyanza, and, working round to the eastwards, by the Surongai range, or Kabras hills, as they are popularly named. Altogether, the area at present under control may be roughly stated at

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* Map, p. 444.

3000 square miles, and, as our influence gradually extends farther to the north and south, it may eventually increase to an area of 4500 square miles or more.

It is difficult to form an accurate idea of the population of the country under control, but it is roughly estimated that the population does not much exceed 200,000. The most thickly populated tract is a line roughly following the Nzoia river, a strip about 10 miles wide, running parallel with the left bank of that river.

The principal rivers are the Nzoia, the Sio, and the Lukos. The Nzoia is about 80 yards wide, with a rapid current, and a course full of huge boulders, falls, and rapids, which render it quite unnavigable; it is often fordable during the months of December, January, and February, and the remainder of the year is usually a raging torrent, which the native canoe-men often fear to cross. The Sio river, on the contrary, is a sluggish stream, placidly flowing through its mud reed-covered banks, and situated in a flat, swampy, alluvial plain; it pours into the Nyanza about one-fourth the volume of the Nzoia. About 4 miles below Mumia's the Nzoia is joined by a considerable tributary, called the Narogari, or Lusumo, which drains a large tract of country as far east as Kabras. Some 20 miles south of Mumia's there is a river which is known by the name of the Lukos, or Rukus, or Yala. This river drains a large portion of Nandi; when it reaches a spot about 8 miles from the lake it suddenly turns northward, and, within a short distance of the Nzoia river, forms a curious lake called Gangu. It then flows out of this by an obscure passage into the swampy delta of the Nzoia. Gangu lake being surrounded by a thick belt of papyrus, navigation is not easy. The average width of the Lukos at low water is from 30 to 40 yards.

Geologically speaking, nearly the whole country is composed of granitic gneiss of a rather uniform type; the usual variety is syenitic, made up of hornblende and orthoclase felspar, with but little quartz; occasionally, in Ketosh and the Nife country, beds of very indurated hornblende schist are met with. In many places surface alluvial deposits of concretionary ironstone conglomerate are seen; these, in many cases, are relics of ancient raised beaches of Lake Victoria, the iron being derived from the decomposition of the hornblende and other iron-bearing minerals in the gneiss. Mount Elgon, to the north, offers a little variety, inasmuch as it is an old volcano, and its bulk largely consists of volcanic ashes and agglomerates. It is greatly to be feared that this country will never prove productive of great mineral wealth, for an abundance of iron ore, with no coal near to work it, can hardly be said to constitute mineral riches.

The prevailing soil is rich red, of a loamy nature, with patches of black alluvial earth in the river-bottoms. Both varieties are of high fertility, and most edible vegetables and cereals, European as well as native, appear to flourish. It is believed that the soil and climate will be found to be suited for the cultivation of coffee.

The altitude of the country varies from 3800 feet to about 5500 feet above sea-level. When an altitude of near 5000 feet is reached, as in Isukha, Tiriki, Idhako, Legolia, and Nyolo, a country of great beauty is found, a country which keeps its verdure even in the dry season; the grass, too, in many places is fine and close, and contains a considerable percentage of true clover. In the neighbourhood of Kitoto's there is a large stretch of flat alluvial country eminently adapted for rice-culture.

One great feature of Kavirondo is the marked absence of timber; there are rings of trees dotted round most of the villages, but the bulk of the country is an open treeless grass-prairie. There is a fine patch of forest at Kikelelwa, another patch about 7 miles south-east of Mumia's; the western boundary of the Nandi country is also fringed with forest. The northern part of Ketosh also contains large stretches of light timber, of no great value save for fuel. The flanks of Mount Elgon are magnificently wooded with timber of high quality; large quantities of bamboos are also found on the mountain.

CLIMATE.

The air of Kavirondo is far drier and more bracing than that of Uganda and Usoga; the heat of the sun is greater during the day, but the nights are deliciously cool. The greatest range of temperature is during the dry season, when the early morning temperature sometimes falls as low as 55° Fahr., and the shade temperature at 2 P.M. will occasionally reach 90°. The dry season practically commences about the close of December, and continues until the middle of March. From March to December it rains with great regularity; in the afternoon of most days there occurs a rainstorm of from one to three hours' duration, accompanied by strong winds and a heavy thunderstorm; rain rarely occurs in the morning. In the year 1895 it is estimated that the rainfall was from 70 to 80 inches, but this year (1896) the rainfall has been much less, and only 59 inches fell. Seasons of drought are, however, of extreme rarity. The rains reach their maximum about August. The strip of country bounding the Nyanza, and known as Nyala, Usakwa, and Uyoma, usually has a much lower rainfall than the remainder of Kavirondo; this is probably due to the fact that the bulk of the storms coming from the east and north-east, their force is spent on the Samia and Maragolia hills, and the clouds discharge their moisture after having passed across the lower area. The area enjoying the highest rainfall is probably Ketosh, which lies immediately at the foot of Mount Elgon. The mean annual temperature at Mumia's has at present only been estimated from observations with an earth-thermometer. One observation gave us as a result 77°, and another 78·5°; we may thus provisionally state the mean temperature as 77·8° Fahr.

PEOPLE.

The people of Kavirondo are far from being the homogeneous mass one might suppose in first passing through the country. There are numbers of small tribes, which may be grouped according to their origin. All the tribes may be grouped under three heads.

I. Those inhabiting the east and centre of the district belong to what is usually called the Bantu family, of which most of the South African tribes and the Swahilis are prominent examples.

II. The people to the west and fringing the shores of the lake belong to what is called the Nilotic group; that is to say, they are related to the numerous tribes which cover the large area often known as the Equatorial Province. Their nearest relations are the Shuli tribe.

III. There is a third group of tribes inhabiting the slopes of Mount Elgon and the eastern fringe of the district, of which the origin is a little obscure; they are either of Hamitic origin or belong to a separate group of Nilotic tribes to the above mentioned. A close study of their languages will, however, probably show the latter theory to be correct.

The following is a list of the tribes of Kavirondo that have come under our control up to the present :—

Bantu group.	Nilotic group.	Elgumi group, or Wamia.	Nandi group (Hamitic or Nilotic, probably latter).
Wa-Kisesa	Wa-Nife	Wa-Ugema	Wa-Lako
Marama	Samia	Kikelelwa	El-Gonyi
Mrashi	Songa	Para	Wa-Savei
Khavi or Tindi	Lego	Kimi	Mbai
Kisa	Nyala	Telemo, etc.	Sor
Ketosh	Kaki	Poto	Nyangnori
Kamuni	Timu	Seguya	Nandi
Tasoni	Sakwa	Brawa, and	and probably the
Kabras	Uyoma	many others	
Nyoro	Milambo	Koko	Elgeyo
Nyole	Sembo and	Tuta	Kamasia
Mangali	Umia		Lumbwa, etc.
Legolia	Semi		
Idhako	Kami		
Isukha or	Kajulu		
Kakumega			
Tsoso			
Tiriki			
Kisungu			
Ioka			
Dongoi			
Muhasa, Konde,			
Fumba, etc., on			
west slope of			
Mount Elgon			

These tribes may be still further subdivided into groups. We will first deal with the tribes of Bantu origin :—

(1) The Wa-Kisesa include the people of Mumia, Tomia, and also

the Wa-Marama. On account of their having had more intercourse with Europeans and coast people, this tribe is the most civilized and richest in the country. The Government station, too, being situated in this district, has a great civilizing influence, as well as being a source of profit to the surrounding people.

(2) The Wa-Khavi, to the north-west of Mumia's, include the Wa-Mrashi and the people under Tindi and Ndui. They are very closely allied to the Wa-Kisesa; in fact, the Wa-Mrashi are under Mumia's rule.

(3) The Wa-Ketosh or Wa-Masawa, situated between the Nzoia river and Mount Elgon, are a numerous people, possessed of considerable pluck, great cultivators and cattle-breeders; they also pay considerable attention to banana cultivation. Their head chief is one Majanja. They are allied to the Wa-Kamuni and the Wa-Tasoni. The former are a considerable tribe inhabiting the south-west corner of the slopes of Mount Elgon, and the latter live away on the north-east boundary of Kavirondo. The Wa-Ketosh are also said to be racially allied to some of the people dwelling on the islands in the north-east corner of the Nyanza.

(4) The Wa-Kabras and Wa-Nyoro live in the eastern confines of the country, and are perhaps lower in the scale of intelligence and civilization than any of their neighbours; they are also less amenable to governing influence than most of the other tribes.

(5) The Wa-Kisa, Kusia, Nyole, Dongoi, Mangali, Legolia, Idhako, Isukha or Kakumega, Tsoso, Ioka, Kisungu are a number of closely allied tribes which inhabit the central portions of the country to the south of the river Nzoia.

(6) To the north-west of Mount Elgon, between that mountain and Busano, exist a little group of tribes which speak a dialect of the ordinary Bantu Kavirondo; there are none of them very important, but the fact is interesting, inasmuch as this is the most northerly limit of this class of language. They are skilled in banana-culture and in agriculture generally.

With regard to the tribes of Nilotic origin, we have—

(1) A group of tribes on the right bank of the Nzoia river, in and around the Samia hills; these are the Wa-Nife, Wa-Songa, Wa-Samia, and Wa-Nyala.

(2) To the south of the Nzoia, and fringing the shores of the Nyanza, are a series of tribes closely allied to the preceding ones. These are the Wa-Kaki, Timu, Lego, Sakwa, Uyoma, Sembo, Umia, Semi, Kami, Milambo, and Kajulu. Some of these tribes have rather a hard existence, their country is so arid that they are only able to raise one crop of millet in the year instead of two, as is usual in the other parts of the country. Those who live near the lake are expert fishermen, and in this way supplement their diet. The Wa-Milambo live on some

large islands in the lake, in the neighbourhood of Ugowe bay. They manufacture large quantities of salt, and this they trade up and down the whole of the east coast of the Nyanza; the salt is done up in small parcels with banana leaf, the packets being sold for one or two strings of beads or so many for a hoe.

The Wa-Kajulu are the most important people of this group. They inhabit a large strip of fertile alluvial land between the head of Ugowe bay and the Nandi escarpment; they are extremely numerous, and their chief Kitoto, although not so civilized as some of the other chiefs, is a more powerful personality in his own district than all the other Kavirondo chiefs; he claims to exercise a suzerainty over the Wa-Semi and the Wa-Uyoma. The nearest relations of these tribes are the Shuli people, who live in the country around Fatiko.

We now come to a group of tribes which inhabit the north-west portion of the district, and these may be generally classed under the heading of the Elgumi or Wamia people. They too belong to the Nile valley races, but to a slightly different stock to the foregoing. They include the Wa-Ugema, Wa-Para, Wa-Kimi, Wa-Telemo, and numerous other small tribes which live to the south-west of Mount Elgon, and the Wa-Tuta, Wa-Koko, Wa-Poto, Wa-Seguya, and Wa-Brawa, besides among other small tribes inhabiting the large area of country between the west of Elgon and the Nile, and broadly referred to as the Wa-Kedi country.

The Wa-Kikelelwa, who are now settled in the heart of the country, also belong to this class. They originally came from Ugema, in the Elgumi country, some fifty years ago, and, marching south-east, crossed the Nzoia river, and eventually settled in the forest situate some 15 miles east of Mumia's, and, once established there, they defied their surrounding neighbours. After some little trouble, they, however, followed the advice of her Majesty's Government and left their forest stronghold, settling peacefully in the surrounding open country. Through continued intercourse with the Wa-Kavirondo, of Bantu origin, they have practically adopted the language of their neighbours; numbers of the older women of this tribe wear a plug of white stone in a slit in the lower lip.

We now come to another group of tribes whose origin is not so clear; they either belong to the Nilotic or Hamitic stock. In appearance they more resemble Hamites, and they have the pastoral instincts which appear to be a characteristic of many of the Hamitic tribes; their languages, however, again contain many words of Nilotic origin, so that, under the circumstances, it will perhaps be well to avoid hasty conclusions upon the subject.

The tribes in question are the Wa-Lako, El-Gonyi, Wa-Savei, Wa-Sor, Wa-Mbai, and Wa-Nyangnori; this group also includes the Wa-Nandi, Wa-Elgeyo, Wa-Kamasia, and others not in this district.

The Wa-lako and El Gonyi live in the southern slopes of Mount Elgon, and are hospitable, friendly people. The Wa-Lako live in walled villages at the foot of the mountain, but some of their number and the El Gonyi reside in numerous caves in the lower line of cliffs. The head chief of the Wa-Lako is one Mongichi. The Wa-Savei, Wa-Sor, and Wa-Mbai live on the north side of the mountain; they live in great terror of the raiding tribes which inhabit the neighbourhood of the Salisbury and Kumama lakes, and who have not as yet been brought under our control. The Wa-Nyangnori live in a small tract of mountainous country under the Nandi escarpment, and are practically Wa-Nandi, but they are bitter enemies of the Wa-Nandi and disclaim any relationship.

It will now be well to briefly review the principal customs, etc., of the Wa-Kavirondo. On the birth of a child, a medicine man is generally called in with his drum to ensure good luck. Six days after the child is born, if it is a boy, or four days after the birth if it is a girl, the mother takes the child and places it in the road at some little distance from the village. Immediately upon her return without the child, another woman in the village goes away and picks up the child, restoring it to its mother; the woman who picked up the child thenceforth stands in the position of a godmother to the child. Upon the birth of a child, the mother allows her hair to grow until the child can walk, and then shaves her head. Great dances, etc., take place upon the occasion of the birth of twins. Among the Wa-Kisesa circumcision is practised; it is unknown among the rest of the tribes. When the child is able to speak, several of the front teeth of the lower jaw are extracted; Mumia's people extract four, the Wa-Nife six, and the Wa-Ketosh two; people who omit this rite are supposed to be unclean, or, as they express it, "the same as the flesh-eating beasts of the field."

Marriage, as amongst most African tribes, goes by purchase, and the number of wives is only limited by a man's means. The richer the man the higher the price he has to pay for a wife; a chief will pay as much as four cattle, twenty goats, and fifty hoes to the father of a girl, a poor man only five to fifteen goats. If a woman dies within a few years of her marriage, the father returns half the price paid. Each wife lives in a separate house with her children, and each has her "shamba" and her share of the cattle, sheep, and goats belonging to the husband. The men eat separately and before the women.

Upon the death of a Mkavirondo, the eldest son succeeds to the property, the chief taking one ox as a sort of succession duty; the eldest son, moreover, marries all the wives, with the exception of his mother. If there are no sons or the sons are young, then the man's eldest brother succeeds to the property and the wives. The wives that have grown-up children are usually excepted from these laws, and live on in the village, each in her own house as usual. The Wa-Kisesa bury their dead in a recumbent position, except in the case of a chief. Upon the death of a chief, the body is placed in the ground in a sitting position, with the head above the level of the ground; an ox is killed by the side of the grave so that the blood falls into the grave, and the raw hide is placed under the body, the grave is filled in, and the projecting head covered with a large earthen pot; an elder of the village sits in vigil by the grave day and night for a month. The grave is usually situated in the hut of the deceased chief. Some years after the death of a big chief, the people of Mumia's dig up the bones, wash them with ceremony, killing oxen, etc., and then rebury the remains on the borders of Ketosh, the Wa-Kisesa having originally supposed to have come from Ketosh direction, the north-east. The Wa-Ketosh throw out their dead into the bush, but the people of Kitoto again bury. After the funeral of a deceased person, the wives form a procession, and visit the surrounding villages, carrying the spears, pipe, and stool of the deceased; the head wife is decorated with cattle-bells fastened round her waist.

When peace is made between two tribes, the alliance is ratified by the process of killing an ox and taking out the heart; this is roasted over a fire, and pieces eaten by the principals. At Kabras a different rite prevails: a dog is tied to a post, the representatives of one party hold the forepart of the animal, and those of the other party hold the hinder part; a chief or elder then takes a knife and cuts the living dog in half, at the same time addressing the assembly to the effect that any one breaking this peace will be cut in half similarly to the dog. The Wa-lako of Mongichi have a different custom: each of the parties provides a spear and an arrow; these are placed upon the ground, the blade of one spear being alongside the butt of the other one; representatives of the tribes stand on opposite sides of the weapons; they then cross over to opposite sides, stepping across the weapons, at the same time haranguing their respective followers to the effect that the arms having, as it were, been trodden underfoot, nothing but peace is to prevail. A dying chief names his successor, but the succession to the chieftainship usually follows the law of primogeniture, unless there is some special reason to the contrary.

The Wa-Kavirondo do not possess a great variety of superstitions, the most important being those which are connected with the question of weather. There are certain individuals who profess to hold the power of controlling the elements. This power is supposed to be hereditary; at the death of a rainmaker a great storm takes place, during which the supernatural power passes from the father to his eldest son. These rainmakers profess to have the power of withholding or bringing rain, and also of allocating exactly the limits within which it shall fall.

Trading upon this reputation, offerings of cattle, goats, etc., are obtained from the surrounding natives, who are naturally anxious to propitiate such powerful personages. If there was a drought of any length, it was formerly the custom to kill the rainmaker, which proceeding, it is said, never failed to produce rain.

The men are usually devoid of dress, the women wearing a small fringe of fibre before and behind. As they become more civilized a taste for cloth is rapidly growing up, and in the neighbourhood of Mumia's large numbers of both sexes are clothed.

The principal ornaments worn are beads and iron wire, which are usually worn by the women in the form of necklets, amulets, and anklets; brass wire is also worn to a slight extent. Amongst the Wa-Kisesa no man is allowed to wear brass wire except the senior chief. Sakwa was formerly the only chief among this people entitled to wear it, but since his death Mumia and Tomia are equally entitled to wear this insignia of power, one as the son of the great chief Sundu, and the other as the son of Sakwa. The Wa-Nife and Wa-Nyala are rather fond of ornament. They have a peculiar decoration of the ears: a number of perforations are made in the lobe of the ear, and a series of small leaf-shaped pieces of beaten brass are inserted and riveted over, a blue bead being attached to each of the brass leaves. They also wear, suspended across the forehead crescent-wise, the split lower canine tooth of a hippopotamus.

The tribal weapons of the Wa-Kavirondo are a pair of small-bladed spears, one for throwing, the other for close quarters; bows and arrows are also used to a slight extent, and the "simé," or spatulate sword, has been adopted from the Masai. They all carry shields of raw hide, 4 feet long by 15 inches wide, rounded at each end. The Wa-Nyala shields are nearly circular, and bent to fit round the body of the bearer; some of the South Kavirondo people carry enormous oval shields, 6 feet long.

The Wa-Kavirondo drink large quantities of beer brewed from the eleusine grain (wimbi) or from the millet; the Wa-Ketosh brew a mixture of banana and millet. The beer is generally drunk in assembly; a ring of men sit round a large jar of the beer, and each man has a long hollow flexible wand with a strainer at the lower end, and all silently suck up the liquid through the tubes; these "pombe" sticks are 7 to 8 feet long. Both sexes smoke large quantities of tobacco, and also "bhangi," or Indian hemp.

The principal occupations of the Wa-Kavirondo are cultivating, cattle-rearing, and trading. The cultivation is mostly in the hands of the women, but it is not, however, thought undignified for men to engage in agricultural work. The great object of a Mkavirondo's life is to obtain cattle, or, failing that, sheep and goats, and all his trading is but a means to this end. The principal local trading is in hoes, cattle, etc., and ivory. The native hoe, or "jembi," is the local unit of currency; the price of ivory is quoted in head of cattle, the price of cattle in terms of so many hoes; for smaller change still, strings of beads are used. There is a considerable trade between Kavirondo and Usoga, which is a good example of the circuitous methods of native trade. A Mkavirondo of Mumia's sells goats, sheep, or hoes for brass wire, which is the usual medium of exchange for their articles; he then starts off to Usoga with his brass wire, where it is in considerable demand, and there purchases goats and sheep; the goats and sheep he takes to Samia, which is the greatest centre of the native ironworkers, and there trades them for hoes, which he brings back to Mumia's. In this way he about doubles his capital in a trip. When the hoes have accumulated to a sufficient extent, he exchanges them for cattle at the average rate of about twenty for a cow.

Ivory trading requires a capital of too many cattle for many of the people to engage in it; it is mostly in the hands of Mumia and a few others, who make a speciality of it. The bulk of the ivory comes from Elgon and Nandi, and does not represent a great amount at present.

The people of Samia, Nyala, and Ketosh are great ironworkers, smelting the iron from the native ore with charcoal, and forging hoes, spears, hatchets, knives, etc., with great skill. The Wa-Kavirondo also make pottery of a simple character, water-jars, cooking-pots, lamps for semsem oil, pipe-bowls, etc. They are also clever at wicker and basket work of different kinds; the people of Kitoto's and the Wa-Nyala also make excellent matting from the papyrus of the Nyanza.

The principal agricultural products are millet and the "batata," or sweet potato; bananas are cultivated to a large extent by the Wa-Ketosh and Wa-Lako. Eleusine, or "wimbi," is also largely grown, together with various varieties of beans, or "maharagui," as they are called. Sem-sem, or sesamum, "mahindi," or maize, various kinds of spinach, pumpkins, and castor-oil are also grown.

The great characteristic of the Wa-Kavirondo as a whole is their honesty; making war upon a neighbouring tribe to take their cattle is considered legitimate, but petty thieving is extremely rare, thus comparing very favourably with the inhabitants of Uganda and Usoga. Except at Mumia's, where they have been corrupted to a certain extent by years of intercourse with the Swahili porter, the natives are very moral in their domestic relations. They are not as a whole an exceptionally brave race, but the Wa-Ketosh and the Wa-Lako stand out high above all the others in this respect. They are an excitable people, easily given to panics and scares, and very often most ridiculous, exaggerated, and unfounded rumours pass through the country and are firmly believed by the people. At bargaining they are pertinaciously obstinate, and, sooner than reduce their price, they will carry off their goods; they also immediately seize the opportunity afforded by a temporary period of scarcity to permanently raise the price of an article.*

BRITISH RULE.

The influence of her Majesty's Government has not been established in Kavirondo without a certain struggle. The fact of the country being split up into so many sub-tribes without any really powerful chiefs has induced a more complicated situation than would otherwise have been the case. The majority of these tribes have long-standing feuds with their neighbours, and the young men of the tribes foster these feuds in order that opportunities may present themselves of raiding cattle with which to purchase wives. In fact, a few years ago intertribal raiding was of everyday occurrence, and the first object of her Majesty's Government has been to check this raiding. Intimately connected with this raiding propensity grew up the demand for breech-loading rifles, and to obtain these certain sections of the people took to attacking passing caravans to obtain rifles and ammunition; others, again, induced men to desert and sell their arms.

These practices all tended to bring about a hostile situation. At the commencement of the year 1895 the Wa-Ketosh were in open hostility to her Majesty's Government, having massacred a party of natives in Government employ, and having on several occasions murdered friendly Wa-Kavirondo belonging to Mumia's, and refused all friendly negotiation. The Wa-Kabras and Wa-Kikelelwa also caught the spirit of disaffection, attacking passing caravans, stealing numerous rifles, and killing stray porters; they attacked the friendly people of Sakwa, and threatened to attack the Government station at Mumia's. When disaffection once appears among native tribes, it generally spreads, if not immediately checked with a firm hand, and later on in the year the Wa-Nife declared war against Mumia's people, and made repeated raids upon the outlying villages. However, as soon as a force was available, at the close of the Unyoro campaign, an expedition was dispatched against Ketosh, which inflicted a decisive blow, and upon its return from Ketosh, proceeded against the Wa-Kikelelwa, and drove them out of their forest stronghold, and at the close of these operations the Wa-Kabras came in and treated for peace. Even after all the above fighting was finished, the Wa-Nife still persisted in refusing to listen to all negotiations, and in January, 1897, an expedition passed through their country, effectually demonstrating the futility of their hostile attitude. After allowing an interval for excitement to subside, peace negotiations were again opened with Ketosh and Kikelelwa, this time attended with success, and the Wa-

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* The Vocabularies collected by Mr. Hobley have been communicated to the Anthropological Institute.

Ketosh and Wa-Kikelelwa are now amongst our firmest allies. Later on the Wa-Nife sued for peace, and all is now quiet, and one advantage of the peace is that it has facilitated the opening of a short route through their country from Mumia's to Port Victoria. As an instance of the increasing influence of her Majesty's Government, it may be mentioned that, being recently in want of a large quantity of building timber, grass for thatching, etc., the surrounding chiefs were each requested to use their influence upon their people to bring in the material, and they all responded with alacrity, and brought in large quantities without any demur whatever, whereas twelve months ago they would have laughed at the proposal.

The external commerce of the district is at present rather small and unimportant. Formerly, numerous caravans of Arabs and Swahilis came up to trade for ivory, combined with a little quiet slaving, but the days of slaving and dealing in contraband are now past, and so few of these ventures turn out profitable that the Hindu merchants at the coast, who finance the Arab traders, have become chary of making advances to up-country traders.

The local price of ivory has, moreover, increased during the last few years, and traders at the present day seldom sit down here to systematically trade, but pass through to Engaboto, Turkana, etc., where ivory is still obtainable at ridiculously low prices. The recent pacification of Nandi is already bearing good effect, the trading relations between Kavirondo and that country are increasing, and the Nandi and Lumbwa ivory market will rapidly become opened up. At present the capacities of transport are taxed to the utmost to bring up Government stores, but as transport difficulties disappear and a greater variety of goods are introduced, the wants of the people will rapidly increase, and it will be realized that the vast number of cattle in the country are a source of potential wealth to the people.

The Wa-Kavirondo are more or less engrossed in their own pursuits of cultivation and the like, and are as yet strange to the idea of working for wages for an outside employer, and the absence of powerful chiefs who could use their influence to induce the people to take up regular work is a great loss. But every effort is being made to gradually initiate them to the idea of regular work, and a steadily increasing number come daily to the station for work. They strongly object to carrying heavy loads and going on caravan work, but are willing to fetch in timber, cut grass, and perform the general work of a station. It will be some time before they can be induced to go long distances from their homes, but with tact they will engage on road-making work and the like. In fact, big public works like roads and railways will do more than anything to accustom them to regular employment.

NORDENSKJÖLD'S 'PERIPLUS.'*

By C. RAYMOND BEAZLEY.

THIS volume is a continuation of Baron Nordenskjöld's Facsimile Atlas, published eight years ago; but whereas the former was devoted mainly to an examination of early printed maps, the present instalment is specially concerned with manuscript sources for the history of cartography. Like its companion, the 'Periplus' is therefore an historical atlas, with an explanatory text, which does not confine itself to elucidating the maps here given, but deals generally with the chief points in the history of Mediæval geography. As an atlas with a cartographical inquiry, it naturally traverses much of the ground covered in the great works of Santarem and Jomard, the 'Ältesten Weltkarten' of Konrad Müller, the 'Studi' of Uzielli and Amat, and similar works; as a history of geographical expansion, it often runs parallel with such surveys as we have in Peschel's 'Geschichte der Erdkunde,' or Vivien de St. Martin's 'Histoire de la Géographie.'

In the atlas proper, forming the second part of his Periplus, Baron Nordenskjöld has given us sixty sheets of maps reproduced in phototype, or photolithography, mainly from originals of the Portolano type of the fourteenth, fifteenth, and sixteenth centuries. But in the two hundred pages of accompanying text he has also given us one hundred smaller reproductions of other works of the same period, enriched, like the atlas, with numerous additions from later cartography of the seventeenth and eighteenth centuries. A few examples are added from the earlier Mediæval work, such as the Beatus and Hereford mappemondes, sketch-maps from Dati's Sphera, part of Ptolemy's and Matthew Paris's England, and a reconstruction of Skylax' (conjectural) Periplus-map.

The text itself is devoted to the following subjects: I. Greek and Roman cartography before Ptolemy. II. The Periplus of Skylax. III. Maps and sailing directions from the second century A.D. to the Crusades. IV. Portolanos (1), their characters, standard of measurement. V. Portolanos (2), comparison between the legends. VI. Portolanos (3), sources of the normal Portolano, date of its compilation, windroses, the invention of the compass. VII. Portolanos (4), the calendar-diagram, directions for tacking, degree-lines. VIII. Portolanos (5), list. IX. Printed Portolanos, sailing directions. X. Maps of the north of Europe, etc., during the "Incunabula period" of cartography. [XI. Sailing directions for the Northern Seas, by E. W. Dahlgren.] XII. Discovery and charting of the ocean coast of Africa. XIII. Mapping of the south and east coasts of Asia, with a list of Asiatic coast-charts, etc., between 1492 and 1561. XIV. America, with comparative lists of the legends on the maps of the same (1527–1546), and with a catalogue of the oldest maps of the New World. XV. The Pacific, to about 1660.

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* A. E. Nordenskjöld, 'Periplus: an Essay on the Early History of Charts and Sailing Directions.' Translated by F. A. Bather. Stockholm, 1897.

From this it will be seen how large is the field covered by this volume; the map-reproductions are on the same level of excellence as those in the Facsimile Atlas; the text gives many interesting and valuable suggestions, tending often to modify accepted views; and the printing, etc., is well worthy of the author and his subject. But, like the Facsimile Atlas, this volume, especially in its explanatory text, requires careful handling; *e.g.*—

(1) As to its general character, the 'Periplus' must be looked at rather as a collection of materials for the history of Mediæval and Renaissance geography than as a connected survey of the same. It presents us with a selection of examples, of widely differing date and character, from the mass of early cartography; it presents us also with many valuable remarks upon various points of geographical history; but it does not seem to divide up the field (as Konrad Müller, for instance, has done), and to work out, section by section, an ordered treatment of the whole, or any great part of that whole. In the splendid map-reproductions which form the second division of this volume, we may perhaps inquire why an historical or local classification has not always been employed. Why, for instance, after such an (historical) order has been followed to sheet xxxii., A.D. 1596, do we then have, after a series of World-maps and Mediterranean portolans, a North Europe (Buondelmonte) of fifteenth century, an England (Matthew Paris) of thirteenth century, and then a West Europe (Benincasa) of 1467, a North again (sheet xxxiv.) of 1558, an East-Europe (Nic. a Casa) of 1491, a Russia, etc. (Anthony Wied), of 1555 ('70), with a succession of "Russian" maps to Strahlenberg of 1730, whose work is to some extent continued in the Asia of Gastaldi, 1561, on sheet liv., followed on sheet xxxix. by the Borgian mappemonde of c. 1450 (Baron Nordenskjöld would apparently date this about 1430); then proceeding to the Mediterranean of Gratiosus Benincasa, 1467, the Indian 'Roteiro' of John de Castro, 1538–9 and 1541; and the La Cosa map of 1500? (2) As to the part of his text specially given to the *chronicle* of geographical discovery, Baron Nordenskjöld seems often content to reproduce the *textus receptus*, as recorded, for instance, in Vivien de St. Martin, Santarem, Peschel, or Major, though with less reserve than has been shown by some of these scholars. Thus, to take a few instances, he appears to accept all the stories of the circumnavigation of Africa in classical time, most of which are unquestionably mythical. With a little more hesitation, he likewise accepts (on p. 54, modified on p. 121) the old position as to Henry the Navigator's "School" at Sagres, now so vigorously challenged.

With more justification, he grants Cadamosto's claim to the discovery of the Cape Verde islands. Far more surprising is his full acceptance of the French stories of fourteenth-century settlements on the Guinea coast by sailors from Dieppe, of the suggestion that Ptolemy's Menuthias is the Madagascar of our maps, and of the tradition that "magnetic cars were used in China more than two thousand years before our era" (p. 49, n. 4). He seems also to show at least an excessive complaisance to the Fra Mauro legends of the early fifteenth-century voyages from India, round the Cape of Good Hope, to the west coast of Africa, and to the traditional share of Martin Behaim in geographical invention (especially admitting, as he himself does on p. 122, Behaim's inaccuracy in matters of geographical history). Is it not too much to say (p. 122, n. 1) that the theory of land to the south of the Atlantic Ocean "never met with any acceptance among geographers," in the face of Ptolemy's own work, and the imitations of the strict Ptolemaic School in later time? The ten years' interval between B. Diaz' return at the end of 1487 and Da Gama's start in 1497 is ascribed wholly to the apathy and want of insight of the Portuguese, whereas it was surely due far more to the long illness and untimely death of John II. (1490–1495), who in his last days was making strenuous efforts to complete the work which Diaz had carried so far, and whose life, if it had continued without ruinous disease, would have probably witnessed the first direct voyage from Lisbon to Malabar, and back again, before the close of 1495. Too much respect, it may be thought, is shown (on p. 82) to the testimony of Solinus about the distance from the Orkneys to Thule, as there is ground for doubting that Solinus is ever an independent authority, or is ever actuated by a desire to tell the truths of nature instead of the marvels of pseudo-naturalism. A sentence on p. 139 is translated so as to allow the casual reader to suppose that Marco Polo sailed home starting from Chipangu, Zipangu, or Japan. The distinguished author seems to us unduly positive that the Laurentian Portolano of 1351, and similar works, *prove* a circumnavigation of Africa in the early fourteenth century; and he seems to take little account of the difficulties in the story of Antoniotto Uso di Mare, whom he confuses with Antonio de Nolli, meeting (in about 1460) with descendants of survivors from the Genoese expedition of 1291 in the Senegal region. The "Friar Cosmas Indicopleustes" (p. 137) is a misuse of terms which may be due to the translator, whose work does not strike us as altogether satisfactory (see on pp. 4, 81, 85, 94, 114, 118, 120, 147), but the view expressed of John de Plano Carpini (p. 138) must be the author's responsibility, and we can only express our surprise at the low estimate passed on so useful a traveller.

It is difficult to follow Baron Nordenskjöld in his occasional reference to Lelewel's (admittedly second-class) reproductions or reconstructions of maps and descriptions, which are open to any geographer to examine for himself (see on Edrisi, p. 141). Justin Winsor has surely thrown very serious doubt on the tale of Columbus' early voyage to Iceland, but this is affirmed with apparent confidence on p. 84. Almost the same definiteness is shown as to the Zeno voyages (p. 86, n. 2).

The interesting paper by Dr. Dahlgren embodied in this volume seems to make, in certain places, the very assumption so ably condemned by Nordenskjöld himself, viz. that statements in the legends of a Mediæval map are to be accepted as determinants of date. Some critics will hardly share the author's confidence in the story of Macham's discovery of Madeira. The date of 1480 for the construction of the fort at Arguim is, we suppose, a misprint for 1448; but we doubt seriously whether the author's assumption that Nuno Tristam reached the Rio Grande can be maintained. The razzias of Prince Henry's seamen, villainous as they were, did not really "begin the African slave-trade." The coins found in Corvo are hardly an adequate proof that either Iberians or Phœnicians ever visited the Azores, though they probably were acquainted with the Canaries or the Madeira group. The African "azaguy" was surely not a "cutting" so much as a "stabbing" weapon. The Beatus Map, given on p. 11, is, of course, that of St. Sever, representing only one of the schools of Beatus cartography, and possibly not so near to the original work of Beatus as the Ashburnham map of the tenth century. The map of St. Sever is not of the eighth century, as implied by the title ("Map of World, by Beatus, eighth century"), but of the eleventh.

But on nearly all matters which properly concern the later Mediæval, and especially the Portolano, cartography, no student can afford to be without Baron Nordenskjöld's last work. It is even more essential than his Facsimile Atlas. His suggestion that the original Portolano scheme is due to Catalan draughtsmanship deserves close attention, and those who have already guessed at this solution, will be encouraged by the confirmatory judgment of the greatest authority on the subject. The author's treatment of the Scandinavian share in cartographical development, as might be expected, is of special value. He supports with much force the Scandinavian position of Pytheas' Thule, though we may think the Shetland site is not yet altogether out of court. These are but instances from a large body of valuable constructive work, in which the author's attempt to determine the length of the Portolan-mile, the standard of measurement in the only scientific maps of the Middle Age (chap. iv.), is perhaps the most noticeable feature. With this admirable study we may join for special mention the tables on pp. 8, 14, 25–44, 48, 52–53, 55, 88–89, 91, 113–114, 126, 131, 148, 167–176, with the author's remarks thereon. Perhaps Baron Nordenskjöld has been disgusted at the over-critical and depreciatory spirit which obtains in some quarters, and has resolved to show it scant respect; so great a scholar is, doubtless, well acquainted with the objections which have been urged against some of the theories and pretensions which he apparently will not contest; but, constructively at any rate, he has, in his Periplus, as in his Facsimile Atlas, given us a princely volume full of indispensable material for the history of geography, and offering in many ways more definite and satisfactory solutions of difficult points than we ever had before.

GEOGRAPHY AT THE BRITISH ASSOCIATION, BRISTOL, 1898.

THE meeting of the British Association at Bristol lasted from September 7 to 14. On September 5, a tower erected on Brandon Hill to the memory of the Cabots was opened by Lord Dufferin, but the opportunity was lost of associating an interesting incident with the Geographical Section of the Association. No description of the tower and no paper on the voyage of Cabot was offered to the Section, nor were there any papers on local geography. The geographical interest of the meeting was thus quite apart from the place, and had no reference to local conditions. The comfort of the sectional meetings was largely due to Mr. Trapnell, the local secretary for Section E, to whose constant care and energetic co-operation the President paid a special tribute at the close of the meeting.

The composition of the section was as follows:—

President: Colonel G. Earl Church. *Vice-Presidents:* Lieut.-Colonel F. Bailey, Sec. R.S.G.S.; Prof. Boyd Dawkins, F.R.S.; J. Scott Keltie, LL.D., Sec. R.G.S.; B. Leigh Smith; General Sir Charles W. Wilson, K.C.B., F.R.S. *Secretaries:* H. N. Dickson, F.R.G.S.; H. R. Mill, D.SC. (*Recorder*); H. C. Trapnell, LL.B. *Committee:* Dr. W. T. Blanford, F.R.S.; J. Bolton; G. G. Chisholm, M.A.; Vaughan Cornish, M.SC.; H. T. Crook, M.I.C.E.; G. F. Scott Elliott; Dr. H. O. Forbes; F. Galton, D.C.L., F.R.S.; Prof. P. Geddes; Prof. R. A. Gregory; Georges Guyou; John T. Kemp, M.A.; Prof. J. Milne, F.R.S.; E. Delmar Morgan; Dr. K. Natterer; H. Yule Oldham, M.A.; E. G. Ravenstein; Prof. Elisée Reclus; G. E. T. Smithson, Sec. Tyneside Geog. Soc.; Eli Sowerbutts, Sec. Manchester Geog. Soc.; Sir J. Benjamin Stone, M.P.; G. J. Symons, F.R.S.

The total number of papers read was less than usual, being twenty-five; but a strenuous effort was made, in organizing the meeting, to ensure that every paper should be read in full, and time left for fair discussion. The proceedings of Section E were as follows:—

Thursday, September 8.—The President read his address, which is printed *in extenso* in the present number of the *Journal*. On the motion of Sir Charles Wilson, seconded by Dr. Scott Keltie, a vote of thanks was passed to Colonel Church.

Mr. Vaughan Cornish read a paper on "Waves," referring to wave forms in water, air, and sand. The paper was a preliminary account of a research which, when completed, will be presented to the Royal Geographical Society. It gave rise to a brief but animated discussion.

The report of the Committee on the climatology of Africa was presented by the Chairman, Mr. E. G. Ravenstein. It includes an abstract of observations in different parts of tropical Africa, and an introduction of which the following is an abstract:—

"Meteorological returns have reached the Committee, in the course of last year, from twenty-six stations in tropical Africa.

"NIGER TERRITORIES.—No returns have been received from Wari since the hostile operations against Benin, and there is reason to believe that the instruments at that station have been destroyed. Mr. E. G. Fenton has forwarded three months' observations from Old Calabar.

"LAMBARENE (OGOWAI).—The set of instruments lent to the late M. Bonzon, of the 'Missions Evangéliques,' has been returned to Paris. The Rev. M. Coillard, well known for his excellent work in the Barotse country, and a trustworthy observer, having expressed a desire to purchase these instruments, the Committee have gladly accepted this offer, as a station in that part of Africa is much wanted.

"BRITISH CENTRAL AFRICA.—The organization of the meteorological service in British Central Africa has been entrusted to Mr. J. McClounie, the head of the scientific department of that Protectorate. From the great interest taken in the work by Mr. Alfred Sharpe, H.M.'s Commissioner, and Captain W. H. Manning, his deputy, we may fairly expect that the climatological conditions of this Protectorate will soon become thoroughly well known. The grant made by the Foreign Office has enabled Mr. McClounie to equip two second-order stations (Zomba and Fort Johnston) and ten climatological stations. Mr. Moir, meanwhile, has resumed his work at Lauderdale, and Mr. McClounie is endeavouring to enlist the co-operation of planters and other residents. Returns for from three to four months have already been received from ten stations, including one from Kambola, on the Tanganyika plateau, from Dr. J. G. Mackay.

"BRITISH EAST AFRICA.—Returns from nine Government stations have been received up to the end of 1897. These returns, owing to the occasional illness of the officials charged with the observations, and temporary absences, are not as complete as could be desired, but in default of something better they have added considerably to our knowledge of the climatological conditions of this Protectorate, especially as regards the rainfall. The exposure, in many instances, seems to be objectionable, and the occasional visit of a meteorological inspector to all these stations would prove of great value.

"In addition to the above, we have received a full year's return from the Scottish missionaries at Kibwezi. These returns include hourly observations for thirteen international term-days, and are by far the most complete received, up till now, from British East Africa.

"UGANDA.—Returns of the level of Victoria Nyanza, up to the end of July, have been received. The mutiny of the Sudanese unfortunately interrupted these valuable observations, but they have since been resumed."

The Committee has been re-appointed without a money grant.

Mr. H. N. Dickson communicated the preliminary results of his research on the temperature and salinity of the surface water of the North Atlantic Ocean for twenty-four consecutive months. This was partly effected by obtaining copies of the meteorological logs of vessels traversing the Atlantic, but also in large part by the voluntary assistance of a large number of ship-masters who collected samples of surface water, which were examined by Mr. Dickson in the Chemical Laboratory of the University of Oxford. The result was to admit of a series of synoptic charts of salinity and surface temperature being drawn—a thing never attempted before on the same scale—and these throw fresh light on several problems of physical geography. There was some discussion on the paper, in the course of which the magnitude of the work carried out by Mr. Dickson single-handed was referred to, and the pecuniary help given by the Royal Geographical Society was spoken of in terms of approval.

Dr. K. Natterer, of the University of Vienna, gave a general account of the oceanographical results of the Austro-Hungarian deep-sea expeditions in the Eastern Mediterranean, Sea of Marmora, and Red Sea. The results of the separate expeditions have been referred to in the *Journal* from time to time.

Friday, September 9.—Dr. J. W. Gregory gave a paper entitled "Theories on the Distribution of the Oceans and Continents," an abstract of which will appear in the *Journal*. It was illustrated by slides and models, and called forth an interesting discussion.

Mr. R. D. Oldham, Superintendent of the Geological Survey of India, gave an account of the Great Indian Earthquake of June 12, 1897, which he stated was the most severe ever recorded; the small loss of life it occasioned was due to the facts that the epicentral area, although of unprecedented extent, was situated in a thinly peopled district, and that the main shock occurred early in the afternoon. He showed a number of slides from photographs, illustrating the peculiar caprices of the shock in damaging buildings and railways, and in overthrowing monuments and trees.

Prof. Milne, F.R.S., followed with an account of the seismological observatories in Italy, and directed attention to the urgent importance of establishing such observatories in all parts of the world.

On Friday afternoon there was a large attendance, when Mrs. Bishop read an account of the valley of the Yangtse, based on her recent journey, already described in this *Journal*. Mr. Archibald Little and others made appreciative remarks on the paper.

Mr. O. H. Howarth followed with an account of a journey across the Sierra Madre of Mexico from Mazatlan to Durango, an abstract of which will be given in the Monthly Record.

The Section did not meet on Saturday, the day being spent by most of the members in taking part in various excursions. Of these, that of greatest geographical interest was the visit to Barry Dock, organized apart from the Local Committee by Section G, under the guidance of the President of that Section, Sir John Wolfe Barry. Contrasted with the scene presented to the excursionists from the Bath meeting in 1888, the site of Barry Dock presents a marvellous transformation. Then it was a vast empty reservoir, excavated in the channel between a sandy island and a barren shore. Now it is the only harbour in the Bristol Channel accessible at all times of the tide, crowded with steam and sailing vessels, and carrying on the greatest coal-export in the world, in the midst of a town of thirty thousand inhabitants, where ten years ago there was only a row of navvies' huts.

Monday, September 12.—The proceedings opened with a paper by Dr. J. Scott Keltie, on "Political Geography." He said that geography, like most other departments of science, is capable of practical applications to human affairs, and the application of the data of physical geography and anthropogeography to communities, states, or nations is political Geography. Physical conditions, such as position on the Earth's surface, determining seasons and climate, the surface characteristics of a region, such as its orography and hydrography, and the dimensions of the territory, all have direct bearings on the State. The question of boundaries and their definition is of vital importance in this respect; the natural limit of a neutral zone of desert, or at least waste land between two nations, gave way to the defined frontier—as often as not an arbitrary line not coincident with any natural feature, and of a validity depending on the general acceptation of the treaties by which it is defined. The utilization of natural resources and the amelioration of routes by land or water do much to develop a country, and bring out the real relation between land and people, which is the direct subject of political geography. The internal conditions of a country are to some extent responsible even for the forms of its government and its relations with other States. These are expressed peacefully mainly by international commerce, which takes place in spite of barriers both natural—such as seas, deserts, mountains—and artificial—such as customs tariffs. Internal development leads in certain circumstances to colonial expansion, and the relations of colonies to the mother country varies in accordance with the character of land and people. The rapid acquisition of foreign territory in recent years has given rise to certain new features of political geography—the sphere of influence, the leased territory, and the military occupation being the more important of these.

Mr. Yule Oldham pointed out the extreme importance of definite views on political geography in education, and others took part in a short discussion.

Dr. H. R. Mill spoke of the prospects of a renewal of antarctic research. He pointed out that the question was a very old one, and that in the history of antarctic exploration, the problem has varied in the course of the centuries from the purely theoretical discussion of the possibility of antipodes, to the search for a vast Austral continent of value to colonists and commerce. Since the voyage of Cook confined the limits of Antarctica to the south frigid zone, and the efforts of a few whalers and sealers of the early part of the present century proved that it could not rival the arctic regions as a hunting-ground, the problem has become purely a scientific one. As a field for scientific research, the antarctic has been kept before the public by Dr. Neumayer of Hamburg for thirty years, and in recent years Sir Clements Markham and Sir John Murray have been indefatigable in pressing upon successive governments the claims of this region for a national expedition. The Royal Society, the Royal Geographical Society, and the British Association have given their powerful interest to the movement, but in vain. The immediate prospects of research are more favourable than the action of Government might imply. A small Belgian expedition with a band of scientific enthusiasts is now in the field, and Sir George Newnes has sent out the *Southern Cross* with Mr. Borchgrevink to make an attempt to traverse the ice-cap from Cape Adare. The results of this expedition may possibly be of value, but they can only be viewed as preliminary. A German committee has completed arrangements for sending out a finely equipped expedition under Dr. Erich von Drygalski in 1900, and the Royal Geographical Society proposes to head a subscription list for a British expedition with £5000. It is urgently important that the great expeditions now being organized should not be in any sense rival projects, but that they should work in harmony, so as to make the greatest possible number of simultaneous and comparable observations on such important and little-known phenomena as the meteorology and magnetic conditions of the south polar area. The preliminary results of the expeditions already at work will probably arrive in time to enable the plans of the larger enterprises to be laid with greater certainty than our present knowledge of the region will allow.

Sir Benjamin Stone, M.P., described his scheme for a national photographic record, the plan including, not only the perpetuation of ancient monuments, historic events, and contemporary social life, but also the sites of towns and other purely geographical subjects.

In the afternoon Mrs. Theodore Bent communicated a paper on "Sokotra," describing the expedition under the guidance of the late Mr. Theodore Bent.

Sir Charles Wilson, F.R.S., gave an account of the Upper Nile region with reference to the reconquest of Sudan.

A crowded audience had collected in order to hear M. Louis de Rougemont on his long residence in Central Australia. He said that he was shipwrecked in 1863 on an islet off the north coast of Australia, and after two years of solitude there, succeeded in making a landing on the continent. Here he met a friendly tribe, who received him as one of themselves, and after some time he set out to cross by land to the east coast, aiming for the settlement of Somerset, on Cape York. Not knowing of the existence of the Gulf of Carpentaria, he mistook the east coast of the gulf for the Pacific, and, coasting northwards, eventually came back to his first landing-place after an absence of about eighteen months. He then attempted to penetrate southwards, with the hope of crossing the continent, but, baffled by the difficulties of the desert, and disheartened by being attacked more than once by parties of white men, who took him for a hostile native, he gave up all hope of escape, and settled down with a native wife. He lived for over twenty years in a mountainous country near the centre of the continent; but then, on the death of his wife, he determined to return to civilization, and, meeting a party of gold-prospectors near Mount Margaret, he reached Melbourne in 1895.

Dr. Keltie stated that M. de Rougemont had been introduced to him and Dr. Mill several months before, and that after a close cross-examination they were satisfied that he had been in Australia. A very long discussion followed, from which it appeared that some members considered that the narrative was too unusual to be true, while some thought that it resembled other published accounts of travel too closely to be genuine.

Tuesday, September 13.—In the forenoon Sir Thomas Holdich was to read a paper on Tirah, but in his absence, through illness, it was read by Sir Charles Wilson, and Mr. Yule Oldham showed the accompanying slides.

Mr. C. W. Andrews gave a brief outline of his observations on Christmas island, a subject of which he will treat fully before the Royal Geographical Society.

Captain G. E. H. Barrett-Hamilton described his visit to Kamchatka, a full account of which appeared in the *Journal* for September, p. 280.

In the afternoon Mr. G. G. Chisholm discussed the impending economic revolution in China, and gave a sketch of the resources of the Chinese empire, laying special stress on the importance of improving the existing means of communication.

Prof. Elisée Reclus set forth his scheme of a great globe on the scale of 1 : 500,000 in a powerful and eloquent address. The plan of the globe was fully described before the Royal Geographical Society, and the full paper will appear in the *Journal*. Sir Richard Temple spoke emphatically in favour of the scheme, and Dr. H. R. Mill called special attention to the importance of having separate sections in the form of relief maps, on the natural curve of the Earth, of separate regions.

Prof. Patrick Geddes gave a description of the geographical museum or Outlook Tower, which he is establishing in Edinburgh, and expressed the wish to see similar towers erected in all large towns. An abstract of his paper appears in the Monthly Record.

Wednesday, September 14.—On the last day of the meeting the Section met early to hear three papers. The first, by Mr. Henry T. Crook, of Manchester, was on the orthography, selection, and location of names for the national maps. He said—

"The method of determining correctly the location or orthography and relative importance of place-names for the national maps, is a branch of cartographical science which has scarcely received the attention its importance merits. With the greater number of names which must appear there is no difficulty. It is with the names of smaller places, detached houses, farms, and ground features of the remoter districts that the difficulties arise, yet the correctness of these is often of equal importance topographically to those of populous towns and well-known places. The Ordnance Survey system of obtaining the opinion of three persons in the locality as authorities seems rather haphazard, for no qualification is required in the authorities, nor does the ultimate selection in case of difference of opinion appear to be anything better than empirical. The Committee of Inquiry into the Ordnance Survey in 1892–93 paid little attention to the subject except in the case of Welsh names, in which they consider the system had not been altogether a success. The errors in other parts of the kingdom largely arise from analogous causes to those investigated, namely, from misunderstanding the local dialect or pronunciation. Wales and Scotland only present the difficulties in a more acute form. The errors in names in the first map of Scotland led to the adoption of a method for that country which is a step in the right direction, namely, seeking the assistance of local societies, in this case the Royal Scottish Geographical Society. This principle carried out still further by the reference of doubtful names to more strictly local societies, or a body constituted from them, is desirable. But if local knowledge is desirable in the case of orthography of place-names, it is not only desirable, but essential to success, in selecting the names for the smaller-scale maps. The present method is a failure, as witness the new one-inch maps in Lancashire, where not only are the names of important places omitted or wrongly placed, but the selection of names which do appear is generally unsatisfactory. This arises from the modern method of producing the smaller-scale maps, viz. the mechanical reduction from the larger scale. It is stated that the names on the smaller-scale maps are gone over on the ground, but the revision seems perfunctory. It does not prevent serious error. The revision of the survey generally should have been carried out from local centres, where local knowledge and experience would have had their due weight."

Colonel Farquharson, Director-General of the Ordnance Survey, said that the Survey had always taken the utmost care to obtain correct names for the maps. He did not think Mr. Crook's sarcastic references to the three independent authorities at all justified. It often happened that local names were in dispute, and cases had occurred in which the squire, parson, and schoolmaster all held a different form of the name to be correct. In such a case the officer of the Survey was obliged to make an arbitrary choice. The question for the surveyors was, not to ascertain the correct or historic form of a name, but the form of the name used locally. Although a committee of the Royal Scottish Geographical Society had undertaken the revision of names on the map of Scotland, they found the task too heavy, and had to greatly limit their programme. He would cordially welcome the co-operation of local societies or of competent individuals; but he held that the proper course to take for any one who had defects in the maps to point out, was to send the corrections to the office at Southampton, and not to write critical articles in local newspapers that might never come under the eye of the Survey officials. Sir Charles Wilson emphasized the importance always attached by the Survey to the proper selection of names, and an animated discussion, in which many members took part, followed.

Captain B. Baden Powell, of the Scots Guards, read a paper on balloons and kites in geographical exploration, in which he pointed out the exceptional advantages offered by the meteorological conditions of the Nile valley for experiments in long-distance ballooning.

The proceedings of the Section were brought to a close by a paper on electric balloon signalling by Mr. Eric Stuart Bruce. Mr. Bruce proposes to use a transparent captive balloon of gold-beater's skin, about 7 feet in diameter, to raise a powerful electric lamp (situated inside the balloon) to a height of 500 feet or more, and by the use of long and short flashes to use it for distant signalling. He considers it particularly suitable for use on polar expeditions.

The usual vote of thanks were proposed, but the rush of the audience from the room made the formality almost inaudible, and quite deprived it of any appearance of grace.

Committees were appointed for the exploration of Sokotra with Dr. Forbes as secretary, with a grant of £35; for the study of the physical conditions and plankton of the English Channel (in conjunction with Section D), by Mr. H. N. Dickson and Mr. Garstang, with a grant of £100; and for the study of Prof. Reclus' scheme of a great globe, without a grant.

Considered as a whole, the proceedings of Section E, while no less popular than in previous years, were more satisfactory on account of the higher average scientific value of the papers than is usually the case. It is, however, questionable whether the labour of organizing such a meeting is not in great part thrown away. The number of geographical specialists in this country is small, and a regrettably large proportion of these do not consider it worth while to attend the Association, hence the discussions are apt to fall into the hands of amateurs, or even of faddists, while the large audiences attracted by any paper which is supposed to be likely to turn out sensational gives to the public an utterly wrong impression of what geographical science is, and at the recent meeting led one newspaper to refer in good faith to the contrast between "the geographical and scientific sections."

THE SWEDISH ARCTIC EXPEDITION.

THE leader of the expedition, Dr. A. G. Nathorst, writes from on board the *Antarctic*, near Tromsö, September 6, 1898—

"Having now finished my arctic expedition for this year, I send you some lines as to the work which has been done.

"We left Tromsö June 8, and went to Bear island, which was reached on the 13th; there we stayed about a week. The whole island was surveyed, and an excellent map (1 : 50,000) was drawn by Lieut. Kjellstrov, partly also by Dr. A. Hamberg. This survey shows that the old maps were quite incorrect. The geological work was also successful. As you will be aware, there were known only carboniferous strata and an old rock without fossils. In this we found fossils, showing that the age was Silurian; and, besides, we discovered another series, the age of which is probably Devonian. But this is not all, for we also discovered fossils in the 'Three Crowns,' forming the top of Mount Misery, which probably will prove to be of Jurassic age. The geology of the little island is, consequently, most interesting. Some new botanical and zoological discoveries were also made. From Bear island we went to Hope island, but a heavy swell unfortunately made landing impossible, so that we must content ourselves with having had the island photographed from all sides. From Hope island I went east of Spitsbergen, in order to ascertain the position of the ice-pack, but, as expected, the ice did not permit of our reaching King Charles Land. I consequently went to the west coast of Spitsbergen, where Bell sound was surveyed and mapped; a most necessary piece of work, since the old maps of Van Mijen bay are very incomplete. After having visited some points of interest in Ice fiord, I made a series of hydrographical observations westwards, to the margin of the Greenland ice-pack (78° 1′ lat., 4° 9′ W. long.). This having been done, I went south and east of Spitsbergen, and reached King Charles Land, which was completely surveyed and mapped on the scale of 1: 100,000. Thence I went to the 'White island,' which was circumnavigated; we landed on the only two places where landing is possible, and the geology of the island was ascertained. This island is curious indeed, completely covered by an ice-cap (inland ice), which is broken off at the sea-shore, ending in a perpendicular ice-wall, just as is found on the antarctic continent, although in miniature. Great table-formed icebergs are given off from this ice-sheet. From the White island, which is larger than is indicated on the maps, we made our way through alternating heavy ice and open water to Charles the XII.'s island, whence we went northwards, and reached 81° 14′ N. lat. If we had been there a fortnight or so earlier, we should certainly have reached a higher latitude, but northerly winds had prevailed for some time, so the pack had driven south again. We then passed north of the Seven islands, and went to Treuenberg bay, Grey Hook, and Danes island, from which we steered southwards along the western coast of Spitsbergen. When we reached the south end of Prince Charles foreland, the circumnavigation of the whole of Spitsbergen, with the surrounding islands, was completed. I don't know if any vessel has done so before. My intention to go to the Storfjord was made impossible through heavy gales, and having in vain waited almost a week for the weather to improve, I steered southwards, passing Bear island again, and making hydrographical observations.

"The scientific work of the expedition has been most successful; we have large geological, botanical, and zoological collections. The geology, zoology, and botany of King Charles Land is now completely known, and there are important connections between the geology of Spitsbergen and that of Franz Josef Land."

ARGENTINE GEOGRAPHY AND THE ANCIENT PAMPEAN SEA.[*]

By Colonel GEORGE EARL CHURCH.

INSTEAD of addressing you upon geography as a science, or summarizing the triumphs of explorers during the past year, I shall invite you to accompany me to southern South America—a step towards the antarctic regions—and let me try to add to your knowledge of Argentine geography and the ancient Pampean sea.

The matchless voyage of Magellan gave rise to one, in 1526, for the discovery of "the islands of Tharsis, Ophir, and Eastern Cathay," the command of which was given by Charles V. of Spain to Sebastian Cabot, the son of John. Sebastian, *en route*, lured by silver-tongued fable, diverted the expedition, sailed for and ascended the Plata estuary and river Paraná, and attempted the conquest of the Plata valley. Disaster attended him; and, with a single ship, he returned to Spain. That valley is now being developed into a prosperous state by the application of £200,000,000 sterling of European capital—three-fourths of which is British—and is already the home of five millions of thriving, intelligent, and energetic people.

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[*] Presidential Address to the Geographical Section of the British Association, Bristol, September, 1898. Maps and sections, p. 444.

Sebastian Cabot having been brought up as a boy in this city of Bristol, I have thought it not inappropriate to this occasion to give you some idea of the land which he tried to conquer, and how nature has there marshalled her forces. She has, within easy reach, all the elements she requires for action upon the most imposing scale; and it must be admitted that she has brought them lavishly into play. The present drainage area of the Plata basin is, according to Dr. Bludau, 1,198,000 square miles, being over two and a half times that of the entire Pacific slope of the Andes. The minimum water-discharge into the Plata estuary would, every twenty-four hours, make a lake one mile square and 1650 feet deep. About 74 per cent. of it would represent the flow of the Paraná, and 26 per cent. that of the Uruguay river. In my subject, the latter plays only a secondary part; the majestic Paraná and its branches assume the primary *rôle*. These interlace with the affluents of the Amazon along a line of 14 degrees of longitude. Even on the ocean, I have been unable to realize vastness, as regards quantity of water, to the extent which I have while standing on the bluff overlooking the Paraná at Rosario, and also on the bank of the Amazon at Obydos. Dark, profound, and mysterious, the rivers ceaselessly roll past, ever in the same direction, never to return; and, awestruck, one reflects that, for æons of ages, they have never halted in their stately march, and asks where and what is the power that gathers and lets loose these mighty floods?

Extent of the Plata Basin in Ancient Times.—I shall try to show that the Plata drainage area was, in a recent geological period, much more extensive than it is to-day; that its most northern limit was in 10° 44′ S. lat., and that nearly the entire waters which now unite to form the Madeira river, the main affluent of the Amazon, once flowed southward into a Pampean sea, which penetrated north over the plains of the present Argentine Republic, to about 19° S. lat.

To elucidate this proposition, I must call attention to the topography of that great Bolivian basin across which the whole northern and eastern slope of the Bolivian Andes and the western slope of Brazilian Matto-grosso send their abundant drainage to the falls of the Madeira. The present elevation of the upper fall has been found, by instrumental survey, to be 547 feet above sea-level. The distinguished engineer, Julio Pinkas, who made the survey, estimated the drainage area of the Bolivian basin at 400,000 square miles. This is somewhat in excess of, but perhaps more accurate than, my own estimate, made when I descended the Mamoré river and the Amazon in 1871. Elsewhere I have shown that the Bolivian rivers lie upon a great plateau, high above the river Purús, as well as above the lower Madeira. The Andes form the south-western and western rim of this plateau; and, between the Mayu-tata and Purús, push low hills north-east towards the falls of the Madeira. On the eastern side are the Matto-grosso highlands, and, south-east, the low Chiquitos sierras of San Juan, the Sunsas, San Lorenzo, Ipias, Chochis, and Santiago, some of them overlooking the Argentine Gran Chaco, and having a southern drainage into the river Paraguay. The grand rim of the Bolivian basin has two breaks; one leads to the Amazon valley, by the falls of the Madeira, and the other, in longitude 62° west from Greenwich, and latitude 18° south, opens into what is now known as the Plata basin. Further on, I will attempt to show how a dam was gradually thrown across this southern gap, until its elevation, once much inferior, became superior to that of the ancient lip of the falls over which the Bolivian rivers now plunge.

The mean flow of the Madeira river, at the moment of receiving its united Bolivian tributaries, is, according to Keller, 8654 cubic metres per second, equal to 305,616 cubic feet. Pinkas makes it 6874 cubic metres. These must be rough calculations; for the mean flow of a river of such variable conditions could only be accurately measured by a series of observations extending over several years. I believe it is equal to that of the Paraná and Uruguay at their junction.

Outline of the Basin.—The Matto-grosso highlands, overlooking the Bolivian basin, are composed almost wholly of red sandstone, overlying argillaceous schists; but near the headwaters of the Guaporé river, which skirts their western base, are found rose-coloured gneiss, talc schists, and sandstones, on which frequently rest large areas of a recent alluvium, locally called *canga*.

The Chiquitos sierras rise, on an average, from 1400 to 2000 feet above the sea. (Minchin mentions a peak 3600 feet high.) I agree with Dr. J. W. Evans that, as described by D'Orbigny, they present evidences of belonging to the earlier Brazilian highlands, rather than the younger elevation of the Andes. The western section is a wall of friable, ferruginous sandstone, sometimes flat-topped, while the extension, towards the Paraguay river, is a compact sandstone overlying talc schist, which, towards the north-east, rests on gneiss in decomposition. The San Juan and Sunsas sierras are the most northern of the Chiquitos group. The former is mostly of gneissic formation, but the latter is of sandstone resting on talc schist.

The Bolivian Andes, which face the Amazon and the Gran Chaco, are almost entirely composed of feldspathic sandstones, micaceous and blue slates, clay and sandy shales, at times showing a thickness of from 10,000 to 15,000 feet. In riding from Cochabamba to Santa Cruz de la Sierra, I have especially noticed them exposed upon a gigantic scale.

The upper fall of the Madeira, called Guajará-mirim, runs over the ferruginous, conglomerate rock called *canga*. This rests on argillaceous sandstone, which crumbles easily by the action of running water. The *canga* gradually becomes undermined, and, breaking in pieces, is moved by the currents into deep water: thus the elevation of the fall is gradually lowered. Keller gives a notable example of such erosion, at a point called Matucaré, on the lower Madeira river. All the other barriers which form the falls are varieties of granitic and metamorphic rocks.

About 18 miles above the mouth of the Beni branch of the Madeira, and below that of the Mayu-tata, is the fall of Esperanza, having a drop of 20 feet in a length of 1000. According to M. V. Ballivian, the rock is of *canga*, the same as that of Guajará-mirim.

Pinkas found that, on the right bank of the upper Madeira river, several places are still visible where the erosive action of the waters has stripped the primitive rocks, anciently covered by a bed of ferruginous sandstone. I also saw evidences of the erosive action of the river near the upper falls, and am disposed to believe that, in the lapse of centuries, one or two rapids higher up the river have disappeared; not, however, entirely, for a reef of ferruginous conglomerate still partly crosses the Mamoré river, between the mouth of the Guaporé and the town of Exaltacion. It is probable that the western Matto-grosso hills once extended westward to the Beni fall of Esperanza, where they met the Andean foothills, and added to the height of the barrier which prevented the river system of Bolivia from breaking through to the north-east. How high that barrier may have been, it is difficult to determine, owing to the country being densely forested; but, in the fork of the Beni and Mamoré, I found hills perhaps 150 feet elevation above the river; and Keller mentions some on the left bank of the Beni near its mouth. The rocks of Matto-grosso are so soft as to offer but slight obstacle to the erosive power of the mighty flood of the Madeira: and, if we admit that the lip of its upper fall, when the river began to flow over it, was only 100 feet higher than now, it will be but a small allowance in comparison to the depths which even unsignificant streams have excavated over the immense area of Matto-grosso. The falls of the

Madeira appear to have completely cleared off and exposed the granitic and metamorphic rocks upon which the Matto-grosso shales and sandstones once rested.

Immense quantities of detritus have found their way down the Andes. The volume carried by the little river La Paz, the remotest branch of the Beni, is astounding. I once descended it to ride round the base of Mount Illimani. The river is so hemmed in between the material of the Titicaca basin and that monarch of the Andes, that I had to ford it 108 times in one day. It has cut a profound gorge through the inland range, perhaps 50 feet wide and 600 feet deep. The overhanging precipices looked not over 40 feet wide at the top. Through this dark rent, which I had to penetrate or turn back, the river swept me, horse and all, as if I had been launched from a catapult.

The bed of detritus and alluvium, which the river skirts for about 50 miles, is one of the most remarkable in the world. Forbes gives it a total thickness of 2000 to 2500 feet "of alternating beds of grey, bluish, and fawn-coloured clays, gravel and shingle beds, with boulders of clay slate, greywacké, and granite, frequently of enormous size and well rounded, as if by the action of water." In my ride down the valley, I saw nature at work tearing into this deposit, and sending it on its way to the great basin of the Beni and Mojos. During certain months, generally from November to March, a prolonged and violent local storm may arise in some lateral valley of the river. The waters then sweep impetuously down, taking with them hundreds of thousands of cubic yards of material which they pile across the La Paz river. The mass of clay and boulders rapidly becomes cemented and compacted, and holds its place until the La Paz in turn, swollen by some storm from Illimani, bursts the huge dam and hurls its contents down the valley. I noticed boulders of many tons weight, at least 300 feet above the bed of the river, sticking, like half-exposed marbles, in the side of the perpendicular wall of detritus which towered even high above them.

Similar denudation is going on along the entire Andean slope. The great Rio Grande carries a prodigious mass of alluvium into the gap which lies between the extreme eastern counterfort of the Andes and the Chiquitos sierras. Even its little branch, the Piray, which I descended, desolates the country far and wide, in periods of flood, with trees, sand, and mud. The Rio Grande and the Parapiti must have transported to the plain, to the east of Santa Cruz de la Sierra, millions on millions of cubic yards of material, and have filled it to a depth of several hundred feet. The examples I have given, from personal observation, can, however, but faintly convey an idea of the grand scale upon which nature is at work tearing down the Atlantic slope of the Bolivian Andes. So far, she has succeeded in only outlining the task she has assumed; for she appears to have finished nothing. The finer touches cannot be put on with such riotous vigour.

Later, I shall show how the closing of the southern gap caused the formation of a lake in the Bolivian Mojos basin, the lacustrine character of which is not yet eliminated; for, during a period of about four months of the year, some 35,000 square miles of its surface are covered with the surplus water which cannot find exit over the falls of the Madeira, they not yet having been worn down enough to give complete drainage to the basin; or else this is not yet sufficiently silted up to keep it out of water. Castlenau says that, "Due to their horizontality, all the plains, from the mouth of the Mamoré to the Pilcomayo, are inundated from October to March, and present the aspect of a great ocean dotted with green islands;" and, speaking of the great southern gap, says, "Across the Monde Grande, a simply overturned tree would change the course of the waters." D'Orbigny is eloquent in his descriptions of the "smooth surface" and "unlimited horizon" of the vast plains of Mojos and the Beni.

Between Santa Cruz de la Sierra and the northern frontier of the Argentine Republic, the Pilcomayo river gathers its waters amidst masses of red sandstone and argillaceous schists. Further southward, the Andes are broken into a number of secondary ridges of palæozoic composition, among which are the sources of the Bermejo and Salado. In the most southern extension of these ridges, we find limestones and compact sandstones, mica schist, gneiss, and granite. From about lat. 30° S., the Andes lose their great width, and thence confine themselves to the Pacific coast ridge, as far south as the Straits of Magellan. According to De Moussy, "the lower sierras, which lie to the east, present a great variety of stratified, crystalline rocks, saccharoids, slate schists, bituminous sandstone, basalts, obsidian, trachites, pumice, crystallized and amorphous quartz."

The Sierra de Cordova, extending north and south for nearly 300 miles, and having a summit about 7500 feet above ocean-level, was probably an ancient group of islands in the Pampean sea. It consists of several parallel chains, composed principally of quartz, gneiss, and limestones of various colours. De Moussey found trachitic rocks on their northern extension, and evidences of volcanic action. South-west, and separated from the Sierra de Cordova, is the low San Luis range of gneiss and mica schist, and sometimes crystallized quartz. Vast masses of rounded shingle, covered by a thin cap of argillaceous earth and coarse granitic sand, border the valleys. The Alto Penasco sierra, 40 miles west of the San Luis range, is also composed of crystalline rocks. The Cordon de Paramillos, near Mendoza, is of porphyry, sandstone, schists, and limestone. Here also, "immense quantities of rounded and rolled shingle cover the base of all the chains and interior valleys. The torrents cut the accumulated *débris* to a profound depth, and expose its enormous thickness. The bottoms of the valleys are entirely composed of it."

Penetrating north of Mendoza, we find white sandstone, and mountains of red sandstone and argillaceous conglomerate in full process of decomposition. These abound, above all, in the provinces of La Rioja and Catamarca.

Southern Extremity of the Basin.—From Cape Corrientes inland, ranges of hills, irregularly massed in line, extend north-west about 150 miles. They are known as the Sierra de Tandil, and are widest at Tandil. Their greatest elevation above the sea is 1476 feet. My old friends, Heusser and Claraz, say the range is "composed of sandstone caps resting on gneissic-granite, showing the Pampean formation in the valleys and on their slopes." Sometimes the gneissic-granite shows bare, and at others elevated into sierras with slopes covered with Pampean formation.

Further south-west, and lying between the Tandil and Bahia Blanca, are the metamorphic sierras Phillahuinco, Ventana, and Curamalal, extending west and north-west, a total length of about 100 miles, nearly to Puan. In 1859, I spent a turbulent period of several months among these mountains, as a member of a commission charged to explore the south-western frontier of Buenos Ayres, which was then being raided by the Patagonian, Araucanian, and Pampa tribes of savages. Referring to my old field-book, I find evidences that some of my notes were made in a hurry.

The greatest bulk of the Ventana range appears to be gathered near the highest peak of the Curamalal section, the elevation of which, by trigonometric measurement, I found to be 3363 feet above sea-level, and the Ventana peak 3563 feet. The inclination of their strata is from 60° to 85°, dipping, with little variation, to the north-east. On their south-west slopes, so far as we explored them, these mountains are composed of extremely hard quartz rock, white, pink, and other colours. In many places, it was cut into large rhomboidal-shaped solids.

The highly calcareous, argillaceous rock-cap of the plain, which lies between the Ventana and Bahia Blanca, slopes west-south-west, its elevation at the southern foot of the Ventana range being about 500 feet, and at Nueva Roma about 230 feet, above sea-level.

Scattered over the surface of this plateau are many hollows, which, in some instances, are 100 feet below the general level. At their bottoms small lagoons are frequently found.

On the *northern* slope of the culminating peak of the Ventana, I found a conglomerate of rounded quartz pebbles, cemented by sandy, ferruginous matter. I have seen specimens of similar conglomerate from the north-west slope of the Curamalal range. I do not know the elevation of the bed which I found, but, for several reasons, believe it to be about 1200 feet above sea-level. It was, in great part, cemented to the quartz rock of the mountain, although masses of it, cubic yards in volume, had broken down or become displaced. Darwin states that, from 300 to 400 feet above the plain on the *south* side of the Ventana (estimated at 840 feet elevation by some Spanish officers), he "found a few small patches of conglomerate and breccia, firmly cemented by ferruginous matter to the abrupt and battered face of the quartz, traces being thus exhibited of ancient sea action." He thus estimates the height of that which he found on the south side of the mountain at, approximately, the same as that which I found on the north side.

Explorers differ as to the character and structure of the great belt of dunes which stretches along the coast from Cape San Antonio to Bahia Blanca. I am familiar with them for a distance of only 70 miles east of the latter place, along which extension they are massed to their greatest breadth and height. Perhaps an unpublished leaf from my note-book, of 1859, will enable you to realize what they are as I saw them :—" We proceeded to explore the course of the river Mostazas among the dunes. For 7 miles we forced our horses over sandhills and through marshes and lagoons, although they sunk to their knees at every step, and frequently floundered to their breasts, in the burrows of the *tuco-tuco*, the *Ctenomys magellanica*, about the size of a small rat. At last they lay down completely exhausted. Far to the east, we could still distinguish lagoons, but not a break in the coast-line gave indication of the outlet of the river, while all around us the bare sandhills reflected the sun with painful brilliancy. The exhausted condition of our horses obliged us to return dismounted. The dunes near the coast are composed of pure quartz sand of every colour, nearly all of it translucent. As they extend towards the interior, they have a slight mixture of earth, until their inland line is found to contain a preponderance of light pulverized soil. Gradually a scanty vegetation appears, until, bordering the fertile lands, they are covered with coarse grass and a few stunted shrubs. Viewed from the north, they have an abrupt descent towards the west. Their coast-line is about 110 feet high on an average; but inland they are of every elevation, from 5 to 100 feet. The south-west gales violently agitate them, and cloud the air with their materials. Frequently, bowl-shaped excavations are found near their summits, which appear like works of art, so regularly are they scooped out by the wind, which must have been of terrific force. One of these, a detached hill of sand and dust, on the Sauce Grande river, about 12 miles from the coast, has had at least 5000 cubic yards of material thus taken out near its top. At the bottom of the excavation I found several fragments of quartz rock, like that on the southern slopes of the Sierra Ventana. In all the dunes composed of pure sand, I found, by digging 4 inches below their surface, on their sides or summits, that the sand was quite wet. Such was the case during our stay, although a very dry season. Numberless little lagoons, from 50 to 150 feet in diameter, with bottoms of soft mud, are scattered among them, around the margins of which grow rushes, weeds, and bunches of the exquisitely beautiful pampa-grass, the *Gynerium argentium.* Often, when the ponds were nearly dry, the soft silky flowers of the pampa-grass had covered their muddy bottoms with a white mantle. Numerous aquatic birds are to be seen swimming in the shallow water of the open ones. Sporting with each other are *nutrias* (the South American otter, the *Myapotamus Coypus*), ducks, geese, black-necked swans, water-hens, and rose-coloured spoonbills, all so tame that I could sit on horseback within 20 feet of them without disturbing the amusements. I have counted fourteen otters in a small lagoon; and, from the apparent familiarity with which they rubbed noses with the ducks, they were as much a part of the family as any of the feathered tribe. I never molest them. It would be a pity to break in upon their Arcadia."

I have lingered among the Ventana mountains and in their vicinity, as they were once lofty islands which played an important *rôle* in arresting and protecting the Pampean mud.

Eastern Boundary of the Basin.—Cuyabá at the head of the Paraguay river, is, according to numerous observations of Clauss, only 660 feet above sea-level. The valleys around it are bounded by vertical cliffs of red sandstone overlying argillaceous shales, which easily disintegrate. The Matto-grosso highlands, south of Cuyabá, as far as Paraguay, are practically unexplored; but I have no doubt they are of the same formation of sandstone and shales resting on metamorphic rocks.

The Apa river, which is the northern boundary of Paraguay, drains a limestone district. Bourgade says "the main framework of Paraguay is a dark-red sandstone, but basaltic formations may be seen in many parts. Immense areas are covered to a considerable depth by a fertile red earth representing the decomposition of the sandstone hills."

From Asuncion, the capital of Paraguay, south-east to the Apipé rapids of the river Paraná, the Cordillera of Caa-guazu throws off a range of hills which overlooks a great triangular space at the south-west corner of Paraguay, slightly elevated above the sea, and consisting of low sandy ground and morasses, at times flooded by the Paraguay river. This district, united to that of the Ybará lagoon, in northern Corrientes, was probably the delta of the Paraná when it emptied into the ancient Pampean sea. The river is charged with but little silt in comparison to its much smaller affluent the Paraguay; but in flood it carries a volume of water said to be ten times that of the latter stream, and its width, along the northern sandstone border of Corrientes, is from 3 to 9 miles. The alluvium, from the immense area of Brazil which it drains, is arrested by the rapids, reefs, and falls of its middle course, where it violently tears a deep channel through huge beds of red sandstone, to afterwards unite its yellowish waters with those of the muddy Paraguay.

Lying between the rivers Paraná and Uruguay is the Argentine Mesopotamia, the provinces of Corrientes and Entre Rios, covered with modern alluvium. The former is gently undulating, and is half drowned in lagoons, the largest being the famous Ybará. The south and south-western part of Entre Rios is composed extensively of argillaceous earth, and the whole State is traversed by ridges of low hills running nearly north and south, the main ones never exceeding an altitude of 650 feet above sea-level. The framework of the province is of sandstone, covered in some places by shell limestone, and sometimes by granular limestone. The north-eastern part is sandy, with numerous hillocks of siliceous gravel. The exposed sandstone, on the river Gualeguay, extends north almost to the Ybará lagoon. On the left bank of the river Paraná, just south of its junction with the Paraguay, is the town of Corrientes, built on a red sandstone bluff. The same stone shows for 30 miles down stream, where it disappears; and thence, for 240 miles the banks sometimes rising to a height of 80 feet, and then at Goya descending almost to the river-level, are composed of sandy clay; but near Bella Vista are masses of rolled pebbles. Near the boundary-line of Corrientes and Entre Rios, the banks of the Paraná are very low on both sides of the river, and continue so for nearly 100 miles; but thence, southward, for 150 miles, the left bank is margined as far as Diamante by a range of hills from 125 to 160 feet high, at times boldly escarped and presenting a fine geological section. From Diamante the hills trend inland south-east about 50 miles, as far as Victoria; and they probably formed the border of an ancient channel of the river Paraná.

From Santa Fé to the head of the Plata estuary, the right bank of the Paraná shows a precipitous bluff of reddish clay, varying from 25 to 65 feet above mean river-level. It is being gradually undermined, and tumbles in great blocks into the river to add to its volume of silt.

The Uruguay river flows, almost throughout its course, over a rocky bed, mostly of red sandstone, at times very coarse, and then, again, of extremely fine composition; but below La Cruz, in Corrientes, there is much limestone, albeit the sandstone still predominates. The Uruguay is, except in flood, a clear-water stream, and, even at its highest level, carries comparatively but little silt.

I have ridden over much of the Banda Oriental del Uruguay. The southern and western half lies from 150 to 300 feet above sea-level. Darwin is correct in saying, "It has a gently undulatory surface, with a basis of primary rocks, and is in most parts covered up with an unstratified mass, of no great thickness, of reddish Pampean mud."

Secondary Rivers.—I refer again to the very important rivers Grande and Parapiti. Minchin says of them, "The Rio Grande drains a considerable part of South-Eastern Bolivia. It has its sources among the ranges bordering the table-land, and flows for some 400 miles through a deep, narrow gorge, and reaches the plains in lat. 18° 55′. Bending north, it then describes a semicircle, and finally runs north-west to join the Mamoré. In its course across the plains, and as far north as lat. 17° 30′, the river flows through a wide sandy bed, bounded by banks from 16 to 25 feet high. The Parapiti rises at an elevation of 2030 feet in lat. 19° 59′ 18″, long. 63° 4′. At the close of the dry season it flows 65 cubic yards per second, and is then absorbed by the sandy region of the plain. In the wet season it runs through a well-defined bed as far as lat. 19° 6′, long. 62° 22′, and then spreads through the swampy, forest-covered plain. Its waters, again uniting, cut through the south range of Chiquitos at Qumome pass, and form Lake Concepcion."

Between 20° and 30° S. lat. the arid, Andean slopes collect and send south-eastward, across the Gran Chaco, the waters of the three great rivers Pilcomayo, Bermejo, and Salado or Juramento. They are almost without an affluent once they leave the foot of the mountains, where they have their greatest volume. Sometimes they split into several channels, making narrow and enormous islands in the plain. They are all very crooked, and have uncertain beds, at times changing an old course for a new one miles distant. Thus they erode and tear away great quantities of Pampean material, dissolve it into silt, and pour it into the Paraguay and Paraná. Pelleschi, in his admirable work on the Gran Chaco, estimates that "the soil annually subtracted from the territory of the Chaco by the Bermejo alone, equals 6,400,000 cubic yards."

The rivers Saladillo, Primero, and Segundo provide the water to meet the evaporation from the great inland lake of Porongos. The Tercero and Cuarto unite and enter the Paraná near Rosario, with a considerable volume of water.

The Quinto, with other small rivers, draining the southern spurs of the Cordova range, are absorbed by the thirsty Pampean swamp, La Amarga.

Some of these rivers carry a large quantity of lime, and many of their westerly affluents carry so much as to have a white colour, thus accounting for the considerable number of them called "Rio Blanco."

A large river system, having many ramifications in the provinces of La Rioja, Mendoza, and San Luis, gathers into lagoons and main channels to find its way to Lake Urre Lauquen, and, in floods, to the Colorado. Physical and climatic changes, of which I shall treat, have profoundly modified this section of the Argentine Republic, and reduced the volume of its waters.

I am indebted to several of the Argentine railway companies for sections of their lines, made from instrumental surveys. From these, and from other sources, including a carefully prepared table of altitudes by the Argentine engineer, A. Schneidewind, I have had plotted the sections which accompany this address.

Sections of the Country.—Section 1 shows a part of the coast-line of the Southern railway. It is practically a cross-section of the east coast of the province of Buenos Ayres from north to south, where the lowest part of the Pampean beds slopes into the ocean. It passes also near the head of Samborombon bay, which was once a great muddy estuary extending far inland, and the home of countless myriads of small crabs. The land slope of this bay so gradually merges into the ocean that, at a little distance, it is difficult to tell where the shore-line meets the water. Century by century, it now slowly advances seaward.

Section 2, from Buenos Ayres to Rosario and Tucuman, shows with what regularity the country rises, from south-east to north-west, up to the outlying foothills of the Andes.

Section 3 is the first 350 kilometres of the Neuquen extension of the Southern railway, and shows in part the relation of the Colorado to the Rio Negro.

Section 4 is the Buenos Ayres and Pacific railway to Villa Mercedes, and thence to Mendoza by the Argentine Great Western. Here we have a line almost on a parallel of latitude nearly to the frontier of Chile. Again we note the regular slope of the Pampa westward, until the country begins to swell into the Cordova sierra. Thence to Mendoza it is broken.

Section 5 shows the Bahia Blanca and North-Western Railway, as far as Toay, and thence its proposed extension to Villa Mercedes. It traverses a district, the southern half of which has apparently been much troubled in former times by water, wind, and sand. From Victoria to Villa Mercedes the country assumes a more uniform slope; but, beyond that, to the north, it rapidly rises into the barren, mountainous districts of San Luis and Western Cordova.

Section 6 is the Central Argentine railway, Rosario to Cordova. This is of interest as showing how far the uplifting of the Cordova range extended east, and nearly divided the Pampean sea into a great northern and southern section. In fact, this railway is the southern border of a belt of rounded-up country, extending from the Cordova sierra to within 30 to 40 miles of the river Paraná.

Section 7 is from Bahia Blanca north to Villa Maria (say 482 miles), thence to Cordova by the Central Argentine line, thence to Tucuman by the Central Northern section of the Cordova Central railway, and thence to Jujuy by the Government railway—a total length, nearly south to north, of, say, 1127 miles. This section presents some notable features: between Bahia Blanca and Carhué it crosses the extreme western slope of the Curamalal sierra; thence to Villa Maria it shows an almost level stretch of Pampa, the lowest part of which, near Trenque

Lauquen, is only about 300 feet above sea-level. This depression is on the parallel of Samborombon bay, down to which it gradually slopes in a distance of 300 miles. From Villa Maria to Dean Funes the line ascends the Cordova mountains, a marked feature of which is their bold western escarpment, overlooking the profound hollow which separates them from the south-eastern spur of the Catamarca sierras. In this depression lies the Salina Grande. From Tucuman to Jujuy, near the Bolivian frontier, the country rises rapidly towards that mountain bastion which is thrown so far east from the Pacific Ocean, and which is the true heart of the Andes. During a ride from Jujuy to Potosi, I could not avoid being impressed with this mighty swelling up of the continent; and on several occasions, especially looking eastward, I was convinced that I could see the curvature of our globe.

Section 8 is the Buenos Ayres Western Railway. It stretches south-west across the heart of the true Pampean plain. The regularity of its gentle slope is remarkable.

Section 9 shows one of the lines of the Southern railway, from Buenos Ayres to Bahia Blanca, and the gradual rise of the country south-westward, up the slope of the Curamalal mountains.

Section 10. This is of great interest. It starts at the Atlantic coast, and is roughly parallel to, and south-west and west of, the Plata estuary and Paraná river, and from 70 to 100 miles distant from them, until reaching a point about 100 miles above the mouth of the river Pilcomayo; thence to the great gap, between the Bolivian Andes and the Chiquitos sierras, and thence to the lip of the first fall of the river Madeira—a total length of about 1770 geographical miles (about 3300 kilometres). This line, from the great gap to the Atlantic coast, was approximately that of least resistance to the flow of the Pampean mud. I have called attention to the very gradual north-eastern swell due to the Cordova sierra. This section clearly shows it, and indicates, moreover, that the Salado, or Juramento, river flows along its lowest margin, and serves as the boundary of the most southern part of the Gran Chaco. In fact, the Salado occupies the south-west side of a very level depression, 300 miles across, and only 240 feet above the sea, along the north-eastern edge of which runs the Bermejo. The northern undefined limit of the Gran Chaco is probably the Chiquitos sierras. From the Bermejo, northward, the section shows the slope of this Chaco district. It is the natural incline which the waters gave it as the sand was poured in from the north.

I have been obliged to estimate the height of the present water-divide between the Plata valley and the Mojos basin. For the first 240 miles north of the divide I allow a slope of 9 inches to the geographical mile, and thence down the Mamoré river to the present lip of the Madeira falls, a descent of about 4 inches to the mile. Like Keller, I found the Mamoré to be a very sluggish stream, "the inclination very small." Barometric measurements I could not take, owing to the failure of some instruments and the loss of others. The height of the upper fall of the Madeira is shown to be 547 feet above the sea. It has served as my starting-point in estimating the summit of the water-divide at 817 feet. Minchin gives a few widely separated barometric measurements on his map of the neighbouring country to the east, and I judge that he makes the divide perhaps 100 feet higher than I do. I should be glad if so able an engineer would give us further information about it.

Formation of the Bed of the Pampean Sea.—A vast area of the Plata valley is covered, to a depth of from 20 to 100 feet, by a bed of reddish-yellow, semi-plastic, argillaceous earth, varying in colour, hardness, and constituent parts. It is mixed with a little sand, and has traces of titanic iron and olivine. Due probably to underground percolation from the lime-carrying rivers, it frequently merges into a marly rock full of calcareous nodules. This rock is found over immense areas of the country, and is at times apparently stratified. Great numbers of the *Calomys Biscacha* burrow in families under the rocky caps which are near the surface, and thus expose them to view. "For this reason," according to Heusser and Claraz, "the Pampa Indians call the hard material 'trui-cura,' or Biscacha stone (*trui*, Biscacha; and *cura*, stone); but the country people have given it the name of *tosca*, of which the literal translation is tufa, whether it be the bed itself or the calcareous nodules contained in the clay. The Pampas are entirely without stones or pebbles. In general the Pampa clay becomes more and more sandy as one goes west. It is the same towards the south, starting from the Quejen Salado. There is much gypsum and carbonate of lime in the deposits, and much fine *débris* of a volcanic nature."

In 1859, in a small cave excavated under a *tosca* cap at Nueva Roma, north-west of Bahia Blanca, I found stalactites from 6 to 12 inches long. Pelleschi tells me that at Puan, where a small stream has cut out a bowl-shaped depression (785 feet elevation above the sea by instrumental survey), there is a cap of tosca covering the district which is well filled with shells, closely cemented, but he does not know the species; and that, on an inland in a neighbouring lagoon, excellent lime is made from a limestone rock found there.

A broad saddle of Pampean formation lies at an elevation of over 600 feet between the Ventana and Tandil ranges. The *tosca* rock is almost everywhere *en évidence* in the sloping plain which surrounds the Ventana and Curamalal ranges, and it is extensively exposed in the banks, and at the rapids and falls in all the little streams. I have noticed that, where these run over *tosca*, it has a hardened surface for a depth of perhaps half an inch. This is due to the hydraulic properties of the rock, which have in places been found so marked, notably at Rosario, in Santa Fé, that a few years ago, Carrasco states, the beds were worked for the manufacture of hydraulic cement.

D'Orbigny, Darwin, Bravard, Sir Woodbine Parish, Weddell, Heusser and Claraz, and others, disagree as to the origin of the "Pampean mud." Darwin wisely said, "it poured down from the north;" but the then paucity of geographical knowledge regarding the interior of South America did not enable him to fix its exact source and method of conveyance. Embedded in the Pampean formation, over widely extended areas, have been found the fossil remains of the mastodon, megatherium, mylodon, and other gigantic animals, those from Rosario to the south being mixed with shells of species still living in the neighbouring seas. After the Pampean beds were formed, and their southern and eastern margin began to emerge from the waters, the ocean along the shallow coast rolled up on the gently inclined plain quantities of shells, banks of which, miles in length, may be seen to-day far inland, giving evidences, by their curvature and general appearance, of having been piled up along an ancient coast-line.

Not far from Bahia Blanca I have ridden for miles along the top of one of these embankments, about 20 feet high, and 100 feet wide at the base. Most of the shells had been broken by wave-action, and were mixed with abundance of rounded pumice, which probably floated down the Colorado and Negro from some volcanic centre of the distant Andes.

But a portion of the Pampean formation is still submerged, for tosca rock may be found throughout the length of the Plata estuary forming the bottom of its southern half. Thence it extends its eastern and southern margin under water, along the coast of Buenos Ayres, at least as far as Bahia Blanca.

The *savants* whom I have named have presented us with abundant evidences that the whole Pampean formation was once submerged. What appears to have confused them is the finding of similar beds in widely separated localities, and at elevations varying by thousands of feet. One may believe that wherever, in the immense drainage area of the ancient Plata basin, the conditions of rivers, lakes, and inland seas were favourable to the distribution of silt from the mud-producing rocks which margin the entire basin in such prodigious quantities, there the "mud" should be found; and it is conceivable that even to-day, if Nature were to form a lake by throwing a permanent dam across the entrance to an extensive valley leading into that basin, the streams entering it would there deposit Pampean mud. If this be true, there is no reason why such mud should not be found resting immediately on crystalline rocks in places. The extent of any continuous bed would alone be limited by the drainage area receiving the silt. The origin and age of a deposit, wherever found, be it at sea-level or 12,000 feet above, or be it a square mile in area or 100,000 square miles, should be treated upon its individual merits. Darwin alone appears to have entertained doubts as to the contemporaneous origin of all materials similar to the Pampean beds, attributing their uniformity more to "the similarity of the rocky framework of the continent."

The Pampean sea connected with the Atlantic ocean between Uruguay and the Tandil Sierra. It was probably about 1400 miles in length, with an average width of above 400 miles. Roughly estimated, its area must have been about 600,000 square miles—say about two-thirds the size of the Mediterranean sea. The area of the ancient Mojos lake was about 115,000 square miles, being seven-tenths that of the Black sea, and exceeding that of the five "Great Lakes" of North America, which is 93,581 square miles. The relation of the Pampean sea to the Mojos lake was similar to that of the Mediterranean to the Black sea. Traces of it are still observable, notably the great, low, flooded morass of Xarayas on the upper Paraguay river, and the ancient delta of the Paraná, including the Ybará lagoon. The Salina Grande was also an arm of it—a great inland fiord. The sea, moreover, must have covered large areas of Paraguay, Corrientes, Entre Rios, and Uruguay, and, before the uplifting of the country, it extended south-west to the rivers Chadi-Leofu and the Colorado, lapping round the southern slope of the Ventana range until the curved rim, concave to the north-east, which connects this with the Sierra de Cordova, was sufficiently elevated to completely cut off its south-western extension. This rim, for the first 50 miles, starting at the Ventana, is about 700 to 750 feet above the sea, and shows much tosca rock near the surface. It afterwards rises rapidly towards the Cordova sierra.

The Uplifting of the Pampean Beds.—The Pampean beds were apparently laid down in shallow water. Their present irregularity and elevation may be attributed to pronounced local uplifting, followed by an extremely slow general upheaval of the Andes from west to east, which was communicated to the whole bed of the Pampean sea, raising it ultimately to its present level. Gradually, as the Ventana, Tandil, and Cordova sierras were lifted, the mud settled upon their slopes until they ceased to exist as lofty islands, and with their connecting-rim of high ground formed a vast breakwater against any inroad of the ocean from the south or south-west. South of latitude 30° the force which raised the Andes has not shown the same vigour which it has to the north of that parallel, where it appears to have been greater in proportion to the broadening and swelling up of the mountain masses. As a resultant of this and its slope to the eastward, the northern section seems to be upheaved from the north-west, while, southward of lat. 30°, the real west-to-east action is apparent. Here the great distance of the Atlantic coast from the Andes has caused the eastern part of the province of Buenos Ayres to be raised but little, not sufficiently to lift the Pampean beds entirely out of the sea. In the north the gradually decreasing distance between the Cordillera and the Brazilian highlands confined the force and gave the plain its maximum lift at the great gap, at about 18° lat., where the leverage of the Andes must then have ceased, due to the fact that, at this point, they take a sharp turn to the north-west, leaving the basin of the Beni and Mojos undisturbed.

This local and general upheaval determined the course of the Paraguay, the lower Paraná, and the Plata rivers, which were naturally pushed over against the more ancient Brazilian formation. It also, as the Pampean sea retired, caused the Pilcomayo and Bermejo to take their south-east course across the Gran Chaco and find their present outlet.

The Cordova range has lifted the Pampean mud to an elevation of about 1300 feet above sea-level.

The Tandil range has brought up, to a height of 900 feet, beds identical with the Tertiary deposits 100 feet below the surface at Buenos Ayres. This indicates an upheaval of 1000 feet since Tertiary times.

Lying between the Bermejo river and the Salado, say the southern third of the Gran Chaco, we appear to have an almost undisturbed part of the bottom of the ancient sea—the present boundary belt between northern and southern climatic influences.

Age of the Pampean Formation.—The United States engineers, Humphreys and Abbot, estimate the amount of silt discharged yearly by the Mississippi river to be one cubic mile in twenty-two years. Although it carries, per cubic foot of water, much more silt than the Plata, I doubt if it exceeds that of the river Madeira, which now drains the Mojos basin, and is a very turbid stream.

The mean flow of the Mississippi at New Orleans is 675,000 cubic feet per second, but its maximum at flood is about 1,000,000. The minimum flow of the Plata, past Buenos Ayres, is 534,000, the maximum 2,145,000. It may, therefore, be fairly assumed that the yearly flow of the great North American river is not superior, and may be inferior, to that of the Plata; and if it be admitted, as I believe, that the Madeira branch of the Amazon, at the falls, annually carries an amount of water equal to that passing Buenos Ayres, it will be evident that the total cubic volume of the streams which poured into the Pampean sea must have been equal to twice that which the modern Mississippi contributes to the Gulf of Mexico.

1 Estimating the Pampean mud to cover an area of 400,000 square miles, with an average thickness of 50 feet, it would represent about 4000 cubic miles of silt. The Andean and Brazilian shales and sandstones were probably disintegrated and dissolved with great rapidity when the rivers which tore them down flowed into the Pampean sea. These streams must then have carried, one with another, a quantity of silt which, compared to that carried to-day by the Plata and Madeira rivers, may safely be estimated at three-fourths the amount per cubic foot of water now carried by the Mississippi river. Allowing for partial loss of silt in the ocean, and from other causes, this would give the Pampean formation an age of about seventy thousand years.

How the Ancient Mojos Lake was formed.—I find the *divortium aquarum* between the Mojos and Plata basin to be only about 170 feet higher than the ancient lip of Guajará-mirim. It is easy to understand that the Rio Grande and the Parapiti have deposited there a quantity of alluvium far exceeding 170 feet in depth. The divide, prior to this and to the general uplifting movement described, could not have been more than 200 to 300 feet above sea-level, and thus much lower than even the present lip of the upper fall of the Madeira. Therefore through this southern gap the combined streams which now form the principal affluent of the river Amazon found their way. Slowly the highly charged, yellowish-brown waters sifted out and spread their heavier material over the sandy slope at the head of the Pampean sea, leaving the fine silt in suspension to be precipitated over the submerged plains. The waters from the north were augmented in turn by the Paraguay and Paraná, the Pilcomayo, Bermejo, and Salado. From east and west numerous rivers pushed into the sea, stirring up its waters, and thus keeping the greater part of the silt in suspension to be carried far southwards and deposited, principally, and in maximum thickness, over the Pampean region south of lat. 30°.

The Grande and the Parapiti entered the plain with a northern trend to contest with the great river of the north the possession of the gap. They struck it almost at a right angle, and slowly pushed their rival eastward over against the Chaco base of the Chiquitos sierras. Here the final conflict must have taken place, as the Grande and Parapiti threw their dam across the outlet of the Mojos river, thus cutting off its exit into the ancient sea. No doubt the giant stream waged fierce war for thousands of years to keep its channel open, alternately sweeping away the barrier and again yielding to the ceaseless volume of sand and clay which, visible to-day, confirms the victory of the Grande and Parapiti. The dam having finally become permanent, the formation of the ancient Mojos lake was assured (see physical map). When it reached the level of the lip of Guajará-mirim, its waters commenced to tumble over it and carve their way to the Amazon. Since then huge volumes of alluvium have poured down the northern slopes of the Bolivian Andes; the ancient lake is now almost loaded with material, but is not yet entirely obliterated. The muddy silt which covers the surface of the basin is so fine that, when an Indian goes up-stream to the mountains, his friends ask him to bring back a stone that they may see what it is like.

Since forming the dam, the Rio Grande has slowly been returning westward down the counterslope which its own alluvium creates.

Slight Tidal Action of the Pampean Sea.—Off the mouth of the Rio de la Plata, the tides which flow south along the Brazilian coast meet those making north from the coast of Patagonia, counterbalance each other, and maintain the liquid mass at nearly the same level, so that the average tide at Montevideo is only about 3 feet. Thus the Plata river is able to pile its silt in a direct line further seaward than either the Orinoco or the Amazon. I have shown that the Ventana range acted as a massive breakwater to the Pampean sea, and that the Cordova sierra almost divided this into a northern and southern half. Hence the prevailing conditions appear to have permitted but little tidal action in the great basin. Had it been otherwise, as, *à priori*, one might suppose, the fierce contests which the tides would have waged when meeting the large rivers would have ripped up the Pampean beds and washed them into the ocean, and, in their place, we should now find nothing but a clayey, sandy, and shingle-covered waste.

In 1860 I located the northern railway from Buenos Ayres to San Fernando. An extremely violent "Santa Rosa gale" swept up the Plata estuary. Finding by actual measurement that when its waters drove against the outflow of the Paraná river they tore 17 feet in one day into the high tosca bluff of San Isidro, I carried the definitive location over the hill instead of round the point at river-level.

The Inter-Andean Region.—The eastern inland Cordillera of the Andes which overlooks the Gran Chaco is separated from the Pacific coast range by a desert, bare, and almost waterless belt of mountainous lands, from 250 to 300 miles wide, through the heart of which I have ridden. An extraordinary parallelism exists between the numerous lines of sierras, mostly running north and south, which fill the space. Between them are deep, scooped-out depressions, sometimes containing salt lagoons. On the rare occasions of violent storms, these receive torrential streams from channels which ordinarily carry but little water, and many of which are dry for most of the year. The whole district appears to be a southern prolongation of the Titicaca basin, and possibly may have been so before the Andes reached their present elevation. As it extends southward it grows lower and less broken, and the *salinas* occupy a larger area until, to the west and north-west of the Sierra de Cordova, they are of enormous extent; but as latitude 30° is passed, the eastern slope of the now narrow Andean chain begins to receive a sufficiently increased rainfall to supply the waters for the western system of Argentine rivers which try to find their way southward to the river Colorado, but which they only reach at rare intervals, when some exceptionally heavy storm aids their effort to satiate the sandy, thirsty desert which they traverse. This area of about 250,000 square miles (not a very comfortable country to march an army across) frequently presents evidences of marine action on a grand scale. D'Orbigny, Darwin, De Moussy, and Burmeister allude to the accumulations of rolled shingle found in the valleys and at the base of the mountains. Darwin speaks of the ocean as having "long acted at the foot of the eastern Cordillera at nearly the same level as on the basin plains of Chile, and that the origin and transportal of these vast beds of pebbles is an interesting problem." Perhaps a thorough study may show that the Patagonian gravel beds—76,000 square miles in area and 50 feet average thickness—were, like the Pampean deposits, in great part derived from the north. For reasons which I shall explain, I believe that all of this terribly eroded, inter-Andean district once had an abundant rainfall, and that, after the heavy material from the mountains had been sorted out, the rivers carried to the plains, to the west of the present province of Buenos Ayres, immense quantities of sand and clay derived from the masses of gneiss, schists, sandstone, and calcareous rock through which they flowed. For this reason, to the west of the curved boundary-line of the Pampean beds, between the Ventana and Cordova sierras, the lands are dry, sandy, and uninviting.

The contour-lines of the country around the lower Colorado appears to indicate that the river once emptied into a broad, shallow estuary, which penetrated inland from the present coast-line about 116 miles. Over its bottom the Colorado dropped its silt, similar to the Pampean mud, but more siliceous. On what was once its northern shore, it is not surprising that Darwin should find "an accumulation of high sand-dunes, ranging westward from the coast twenty miles distant," and which he believed "were formed on the shores of an estuary." It probably included the present Bahia Blanca and its coast-line as far as Mount Hermoso, to the east of Punta Alta, where Darwin found so many fossil remains of gigantic mammifers. May we not suppose that these came from the north, were floated down the Colorado, and taken to this point by the northern currents which swept along the Patagonian coast?

Climatic Influences.—It must be admitted that an ancient sea two-thirds the size of the Mediterranean, and a lake much larger than the total area of the "Great Lakes" of North America, must have profoundly affected the climatic conditions of the adjoining regions. Perhaps no part of the world presented an example where the forces of Nature had an opportunity to display their power in equal magnitude, over such a continuous area, and with such uninterrupted simplicity. To the west, the Andes served as a lofty condenser, which, for a distance of over 2500 miles, guided the cold polar currents towards the equator and safeguarded their vigour. Similarly, the Brazilian highlands largely confined them to the great valley as they swept northward to do battle, in the heart of South America, with the warm vapours generated from the Pampean sea and ancient lake, and the steaming, tropical basin of the Amazon. The extension of the vapour belt southward towards the Atlantic ocean carried the equatorial currents nearer to the polar ones, thus inviting frequent atmospheric disturbances and resultant storm action. As the hot, vapour-laden winds, fertile in elements and force, met the southern cold ones, a prodigious amount of heat was set free by condensation. Into the vacuum thus created the opposing currents rushed with ever-increasing rivalry, enlarging the area of mechanical action, condensation, and vacuum, and augmenting the violence of the storm-waters, which, sweeping along the mountain slopes, must have rapidly disintegrated and eroded them, and have acted as a potent agent to transport to their base much of the material from which the Pampean beds were sifted. The rainfall over the inter-Andean region must have produced many large lakes similar to Lake Titicaca, and a great river system, which, tributary to the Colorado, swelled it into a stream of the first rank, pouring into it the sand and silt which have completely filled the enormous estuary, the outline of which is still traceable.

One may believe that an increased rainfall gave a luxuriant vegetation, where herds of gigantic mammalia found feeding-ground; from which, from time to time, they were swept, by storm or swollen river, into the Pampean sea, where also they may have lost their lives in other ways, their remains being distributed over it by the currents.

To a minor degree the ancient sea and lake must have affected the inter-Andean climate, from Cuzco to the south, throughout the lacustrine basin of Titicaca, giving it greater rainfall and fertility than it now has. Geological examinations show that Titicaca was once one of the large lakes of the world, and that it has slowly been drying up. Does its gradual diminution date from the disappearance of the Pampean sea and Mojos lake?

Savage man may have lived in South America on the mountain slopes round the ancient sea. If so, he possibly hunted the mastodon, the megatherium, and numerous other of the gigantic fauna which probably were co-existent with him. His only highway, between the eastern and western halves of the continent, must have crossed the elevated region at the head of the Pampean sea, lying between 17° and 19° S. lat., which is still the only route in use for communication by land between Bolivia and Matto-grosse.

A GREAT GLOBE.[*]

By Professor ÉLISÉE RECLUS.

Recently being in conversation here in London with a traveller and discoverer, I mentioned the great geographical importance of accurate representations of our planet in the shape of globes; suddenly he interrupted me, and said with a smile, "What is the use of your Lilliputian globes, ten, a hundred, or a thousand yards thick, when you have the very globe itself, our good and beneficent Earth, to walk over, to look at, to study, and to love?" Of course I laughed, and thought with him that all representations and symbols of life are very little in comparison with life itself: our works are small when contrasted with nature. But the great man who thus spoke in joke knew as well as I do, the value of scrupulous effects in geographical work. He has himself drawn very useful maps, which enable us to follow him in his great travels. We cannot all perambulate the surface of our planet, but we may still be very useful in a secondary way. The great question is to know in what direction we are to exert ourselves in order to produce the greatest amount of perfect scientific labour. The chosen few will make discoveries; the others, less fortunate, but happy still, will follow in the track opened to them.

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[*] Paper read at the Royal Geographical Society, June 27, 1898.

One of our eminent geographers, who is present at this meeting, Dr. Hugh Robert Mill, gave us, a few years ago, a lecture on the "Geographical Work of the Future," and put great stress on this, that "accurate cartographic representation is the very essence of geography." Certainly he was right. Accuracy of design is of paramount importance, and this is the reason why geodesists measure the surface of the Earth with such wonderful care and precision: a difference of a few millimetres on two measurements of a line of base is justly a great matter of discussion, and obliges the scientific bodies to begin the work again. Thus a perfect exactitude is obtained in geodetic calculations, and the real distances and proportions of all geographical features are triumphantly made out; but the results, although fulfilling all expectations and perfect in registers and tables, are in a certain measure practically lost on the deceitful maps and charts: there truthful representation is quite out of the question, at least for all parts of the figure which are not delineated on the centre of the map. A plane surface never will nor can be the real representation of a spherical surface. Splendid devices may be imagined by the mathematicians to lessen the importance of errors according to this or that dimension of the map, but although I do not deny the immense conveniency of maps, without which there would be no geography at all, still we may point out the errors which will subsist, and sometimes we feel tempted to ask, "What's the use of having secured perfect accuracy in measurement, within one millimetre, when on paper the errors must amount to yards, furlongs, and miles?"

There is only one way to represent truly the surface of the Earth. Curves are to be translated in curves; a sphere or fragment of a sphere must be reproduced by another sphere or fragment of sphere. Therefore are we really astonished that public attention and the special care of geographers are so little attracted towards this logical mode of geographical work.

The progress of cartography proper has been really immense. When we compare the maps and charts which are now constructed by the various industrial, maritime, and military staffs with the very interesting maps of the last century, which had been also constructed with great care by the best geographers and at very great expense, we are struck by the marvellous increase of those documents, not only in quantity, but also in quality. I may say that certain maps, where the scale is very large, and which, in fact, may be considered part of an immense globe, are at the same time so gloriously embellished by colours and graduated tints that they are really wonderful to look at, both as true representations of nature and as marvellous works of art. The impression which genuine geographers feel is very near or even entirely similar to that of an artist before a glorious picture or statue. To see nature itself, and to behold at the same time a picture of it in perfect accordance with the reality, is positively a rapture. As examples, there are the official maps of Switzerland or the Bay of Naples.

But, returning to sphærography, we must avow that there are very few globes or segments of globes which have been made with sufficient care to be held in comparison with the best charts. Generally they are much less scrupulously drawn, being constructed more for show than for science; they are less worthy of attention. Of course, some of the elaborate globes which have been issued by various publishers are altogether very creditable objects, but few are to be studied with the same confidence as maps in almost all civilized countries. Some of the globes which have been constructed are huge in dimensions. There is one cut in a rock, I believe, on the seashore near Bournemouth, but I don't know if it has any real value. There was one at the last Paris Exhibition which was some 120 feet in circumference, being one-millionth of the mother Earth to scale, and I must say this gigantic globe has left on minds of the three hundred thousand people who saw it a very deep impression, by the mere comparison of dry land and sea, and the large proportions of countries which are ordinarily shown in Lilliputian forms in most atlases. I remember, also, the real feeling of rapture which pervaded me when, in my youth, I walked inside of Wylde's globe, near this very place, admiring the magnificent sight. But that noble structure, as well as the Paris Exhibition globe, made no pretence to accuracy in geography proper; they had been designed only to be looked at from afar, without any special study of minor details.

The Paris globe was to be seen from the outside, on a winding staircase; the London Wylde's globe, forgotten now by our contemporaries, was seen from the inside, and was to be contemplated at one circular glance. According to Alfred Russel Wallace, whose opinion has such great weight, the last method would be really the best.

I repeat it again, this department of geography, sphærography, although the most important to develop, has not kept pace with the other, cartography, and I presume it will be a real revolution when it has taken in science and practice the paramount place it deserves. At present small globes are very much in use for schools, but we know how that part of the educational furniture is shamefully neglected; the very fact that it is found in elementary classes is one cause of the disdain in which globes are generally held. There is, perhaps, another reason. Globes of large proportions are very cumbrous objects, and in our crowded cities, where space is so expensive, it is very difficult to find place for these scientific guests. And, above all, the best of reasons is that education has not been yet directed in that way, and people, even scientific people, are not yet sufficiently convinced of the absolute necessity there is to study geography on images of our planet reduced to a commodious scale and with the real proportions. There is no geographer, however learned and accustomed to the reading of maps, who is not constantly at a loss to understand immediately, at the sight of charts drawn on all kinds of scales, what exact proportions the country represented bears to his own land or district. He will not see the real state of things; he will try to remember the figures he has learnt by heart, or make tedious calculations, which are a great loss of time.

So it is that for us all, learned or unlearned, the direct study of geography on spherical surfaces is absolutely necessary. If the scale of the globe is very small in comparison to the real dimensions; if it is, for example, in the proportion of only one to 10 or 20 million, then the surface is to be kept even—polished, we may say—because the roughness of the highlands and mountains cannot be represented with sufficient relief. On such a ball, 6 or 12 feet in circumference, the highest mountain of Himalaya would not represent $\frac{1}{25}$th of an inch in height, and the ordinary hills would hardly alter the regular surface of the globe. But, with larger spheres or fragments of spheres, another element of truth and beauty is added to the construction; the actual relief appears on the curvature of the model.

And here allow me to say, once for all, that the system of exaggerating the proportional height of hills and mountains on the surface of globes is utterly bad, contrary to real science, and ought to be discouraged by all geographers respectful of nature and its laws. In that way the utmost ugliness is attained; people who do that kind of work seem to think themselves above all sense of reality. Thus we hear that the ladies of the Philippine islands, wishing to make a valuable present, imagined to have a representation of their archipelago made by a jeweller with rubies for the cities, sapphires for lakes, and other costly stones for volcanoes. Of course, many thousand pounds were expended for that miserable rubbish.

All the pseudo-relief maps which show us slopes with two, three, fifty, one hundred times their real proportions in height, inconsistent with the facts, and violating the forces of gravitation, are the logical consequence of a childish desire to represent grand sights as if they were always stupendous, wonderful, next to miraculous. It is in the same spirit that, during the first part of this century, before the invention of photography, painters were prone to exaggerate in their pictures twice, or even three times, the real proportions of mountains in altitude; conscious in a certain measure of the deficiency of their art, they relied on falsehood to make it more eloquent. Happily, new discoveries have enrolled the sure, the victorious light of the sun on the side of truth, and now we have by thousands and by millions splendid pictures of mountains, which give to our eyes the true sense of proportion, and certainly do not diminish our conception of beauty.

The revolution which photography has accomplished in pictorial art is to be achieved also in relief construction. We are to be most strict in one thing—keep always to the truth. It is the best plan in scientific work as in life. Truth in scales: therefore it is that we must use globes instead of maps as frequently as possible. Truth in heights of relief: therefore do we leave entirely out of question the idea of showing any apparent roughness on globes or fragments of globes under the scale of one-millionth. On such balls colours and shades only will be convenient to represent the various altitudes on the Earth and depths in the sea.

But as soon as the globe or fragment of globe is large enough to show at least one-millionth part of the Earth in real proportions, then we may try to represent as well the heights and depths as the planimetric dimensions. Of course, the chiselling and moulding of the surface will be more and more elaborate in proportion to the increase of the scale. On a globe of one-millionth, the great masses of highlands and mountains, 3000 feet in height, will hardly appear above the plains, and only by the contrast of light and shade; but summits of 10,000 or 12,000 feet will be seen perfectly well—the more so, that to show forests, pastures, snow or ice, various colours and tints will heighten the effect as they do in reality. If the size in diameter be doubled, the impression of the sight is increased, and the relief is represented with much greater accuracy. If you construct a very large globe on the scale of 1 to 100,000, then all the details of elevation and depth will appear most distinctly, even hills and hillocks 150 feet in height. You see the very Earth as if you were sailing above it in a balloon. The representation of such heights, whose appearance our eyes are accustomed to, gives us an unexpected advantage by furnishing us with a standard of comparison. To give us an idea of the real height of a building, photography and painters put men or women standing all around or leaning against the pillars. Thus spectators of a relief will easily estimate, by comparison with known heights, the real dimensions of the hills and mountains which diversify the surface.

There has been in Switzerland lately a very interesting public controversy. A skilful cartographer and relief maker (M. Charles Perron) had proposed to the Federal Council to construct, for the Paris Exhibition, a relief of Switzerland on the scale of 1 to 100,000, which, he said, would do honour to the country; and, indeed, the samples of the work which he exhibited at Bern and Geneva excited general admiration. Evidently the undertaking deserved to be encouraged, and it would have been taken under the official patronage of the Swiss Republic if a few influential geodesists had not interfered, asserting that a true and perfectly detailed representation of nature wanted a larger scale than the 100,000th. As in examples of their contention, they referred to the parting of slopes on nearly horizontal ground;

the geographical changes brought in the configuration of a valley by the advance of a morainic ridge; the displacement of the courses of rivers caused by landslips and erosions—all facts of small magnitude in their origin, but of great geographical importance, and which are to be fully represented on large relief to be clearly understood. Pamphlets and articles were published on both sides, and the question was fully elucidated by most competent scholars.

Now we may resume the discussion. According to the effect which must be attained, and the elaborate study which is aimed at, scales must be different in globes, as also they are in all other modes of representation, maps, charts, and plans.

If our intention is to show the majestic appearance of the Earth, with its continents and seas, with its mountains, rivers, and plains, if it is to give a perfect idea of the interaction and interdependence of all organs in the grand planetary body; then, by all means, let us construct a large globe, where we may be impressed by the mass itself, by the harmonious forms of the countries we know, and specially love and study. But if our aim is to show the details as thoroughly as possible, and the means be not sufficient to construct the globe at a convenient scale, the only way is to model fragments or parts of sphere in proportion of 1 to 50,000, 25,000, 20,000, 10,000, 5000, as may be desirable. With the increase of these treasures, geographical societies will acquire documents enough to represent in reality whole parts of the Earth in miniature, attaining the utmost perfection, and satisfactory both to the learned and the artists.

This is, in fact, the thing which will be done in Switzerland. Two objects are to be attained, and therefore work will be directed in both ways. I hear M. Perron's great work will be pushed on with great enthusiasm, and we may hope to see, two years hence, in the Paris Exhibition, his complete relief of Switzerland on the scale of 100,000—the most complete, and certainly the best of the kind, which geography will possess; and, on the other side, all those who have carefully inspected the Polytechnium in Zürich know what splendid achievements local geodesists have made in the shape of mountain-reliefs on very large scales, showing and explaining at the same time the features of the country. Nowhere in the civilized world do we find so much and so great work accomplished in the way we recommend.

Among the conquests of a proximate future, I think a better division of labour will be introduced in geographical bodies. Already a very great improvement has been made in the scales of maps, especially for large geographical works. Nearly all these are now constructed according to a scale with very convenient decimal numbers, 100,000, 50,000, 40,000, 20,000, which allow us easy arithmetical comparison, all numbers being a multiple or a decimal fraction of another. The United States squeezed, so to say, between two tendencies, to measure still in the ancient way, by inches or parts of an inch to the mile, or to deal with great decimal masses, have chosen for their maps the various scales of 250,000, 125,000, and 62,500, which last measure is so very near to the proportion "one inch to the mile," that it may be considered as practically the same. In reliefs, even more than in maps, the habit has become general to take regular scales with full thousands and tens of thousands; thus comparisons are more easily made between the various productions. This tendency of relief-makers will, I hope, grow more and more common, and gradually, by mutual, though informal, agreement, their works will be made according to a few commodious patterns, and constitute as many different parts of great globes constructed on the same scale. If all these disjointed and scattered parts, well reproduced and regularly exchanged between the authors and the geographical societies, were collected and put together, the construction of entire globes on very large scales would be found very much advanced. People would be astonished to see what large fragments of continents in relief we already possess, if they saw in a great hall, put in their proper place, all the plans of the Alps, Pyrenees, and Auvergne, and other mountainous lands. These relief constructions on large scales are the necessary complement to the lesser globes, for whose construction we plead urgently.

This spontaneous organization of labour which pervades the scientific workers in the common field will prevail more and more. We see already the various geographical societies uniting every year more intimately to distribute the business among themselves. Small societies have their very important part for local efficiency, and we may expect from them searching studies on the special questions relative to their own or surrounding countries. Larger bodies residing in important seaports or commercial centres have a greater field of action, and their natural circle of study embraces especially the parts of the world which belong to the general market of their cities; lastly, the societies, whose area of action and reaction is the immense world at large, are invested with a mission of high and noble import—to centralize every document belonging to the Earth at large, and to any part of it specially; to collect in their libraries all the books, all the pamphlets and documents, that have been written or published anywhere in the world; to have the entire set of maps, charts, and plans which have been constructed and drawn by geographers and engineers in the entire world; and especially to offer to their guests, who are, so to say, the delegates of all mankind, a model of the Earth, under the shape of a globe, vast in dimensions, where every man will find himself at home, and even will learn to know his own country better than before, where he may also indicate all possible corrections and improvements;—such a model, in fact, which will afford a standard of scientific perfection which human intellect and skill are able to attain. This is, I think, what the legitimate ambition of a geographical society ought to realize, and will certainly realize, in the proximate future.

Among all the riches which I foresee in our palaces and museums on geography, there is one, as is implied in the subject of my lecture, to which I look forward with an intense desire. Now, at a time when every morning and evening newspaper brings us news from all parts of the world; when every one of us, even the least fortunate, is fed and clothed with productions of all continents and seas; when we all have friends across both oceans in the antipodal countries;—the moment has come for us to have grand representations of our common home, and not to satisfy ourselves with petty spheres, round copper balls, similar to that which Krates of Melos exposed to the curiosity of men in the temple of Pergamos, twenty-one centuries ago. Now Globes must be temples themselves, as well by the magnificence or proportions as by the beauty of workmanship and the scrupulous care of scientific drawing. In sight of such constructions, people must feel grave and respectful, not only because those monuments consecrated to science will partake of its majesty, but also because they will belong to all men, without any privilege for race or nationality, and will help to strengthen within us the feeling that we are one and the same family.

Before the reading of the paper, the PRESIDENT said: We have with us this evening one of the most celebrated and eminent geographers now living, M. Élisée Reclus. He has come amongst us to give us his views respecting the use of globes. I now request M. Reclus to read his paper.

After the reading of the paper, the PRESIDENT said: I have no doubt several geographers will wish to discuss this extremely important paper which M. Reclus has just read to us. I will first call upon Prof. Geddes.

Prof. GEDDES: In these days of peace and war, I do not think that we need insist upon the practical importance of such a globe as is suggested by M. Reclus. We all want to see large maps and their relations to one another. As regards the more purely intellectual uses of M. Reclus' globe, while he has been speaking I have been thinking of Mr. Herbert Spencer, and how both the concrete and the abstract mind are each working out their own view of the world into one great unity. Again, as to its use in education. M. Reclus' assistant paid us a visit the other day in our own college. He came to us and described the project which his chief has outlined in greater fulness, and to this little meeting there came all our own professors—the mathematician, who happened to be a practical constructor of reliefs; the engineer, who happened to be deeply interested in the question; we had the physicist and the chemist, the zoologist. It also brought the lecturers on history and classics, each showing, from his own point of view, his interest in the construction of M. Reclus' globe. Here, then, is a little example of how such a project immediately tends to bring the educational machinery of so many departments, and of all kinds, into an active and real co-operation. And if I had any doubts before, I had none afterwards, that such an undertaking would stimulate the universities and colleges and all the schools, and help the labours with which Dr. Keltie is so eminently associated, those labours for the improvement of educational methods of teaching geography; for the globe scheme would co-operate very widely with the whole movement of geography from the universities to the elementary schools. I do not think I need argue much in favour of the project. I should like to say that it would be a pity for such a meeting to disperse without some kind of practical outcome to it; and, if I may go still further, it seems to me that a meeting of this kind has nothing to do with questions of sites or finances; but it has to do with the scientific and the constructive problems. I presume it is an open secret that if M. Reclus chose to carry out his undertaking on lines of popular amusement and advertisement, it might have been carried out a long time ago. But M. Reclus has maintained a strict attitude in this respect. Serious and practical geography demands, therefore, that it is necessary for scientific men to help him to maintain this attitude, and not to vulgarize science by making a vulgar exhibition of it in any way, but to carry out the scheme of such a temple of science as he has so eloquently described. As to details, I think engineers and scientific men should all have an opportunity of discussing these. If I may be pardoned for criticizing the lecturer, I am sure he must feel that the project which he had prepared for the Paris Exhibition would have to be revised and re-revised, and every serious geographer and engineer, I am sure, would come to the same conclusion. Mr. Alfred Russel Wallace writes, vigorously maintaining his old project of a hollow globe as a superior one to that of M. Reclus. Again, from an engineer, I have a plan of how to rotate the globe and show all the phenomena of the seasons; the globe would seem to be floating in space. The interest shown in this matter shows that a project of this kind could be carried out, if properly planned and organized.

Mr. J. B. Jordan: I did not expect to be called upon to make any remarks; but, as you have kindly mentioned my name, I will say a few words with regard to the scale. Elevations in relief would be so remarkably small if constructed on the proposed natural scale of 8 miles to an inch. Taking the British Isles for instance, our great mountain Snowdon, which rises about 3500 feet above the level of the sea, would be represented by only one-twelfth of an inch, and that would be exceedingly small. If Snowdon is represented by one-twelfth of an inch, how very slight the elevations would be to show the larger area of the British Isles! We have very large tracts of land that are below 500 feet in height, and it seems to me that on a model constructed on a natural scale of 8 miles to the inch, such heights would scarcely be visible, and the greater part of the British Isles would practically be as smooth as a plain. I therefore think that a model globe on a natural scale would have but little value, as far as the British Isles are concerned. The vertical scale should be true throughout, but, for practical purposes, I think it should be somewhat exaggerated.

Mr. Henry F. Brion (publisher of raised maps): I quite agree with the last speaker and the lecturer. During last year I made a large model of the river Thames, on a scale of 6 inches to the mile, and even with that scale, which was 6 inches to the mile instead of 8 miles to the inch, which is proposed for this globe, in order to show the elevations, it was necessary to increase the vertical scale four times. And, according to public opinion, the elevations then were not too large. Of course, the valley of the Thames and the hills surrounding it are small, I will grant. But still, if you make your large globe on the scale of 1 : 500,000, the vertical scale equal to the horizontal elevations of the height of even 500 feet would be no more than a few sand-grains sprinkled about the globe. I might say that on my model of the south-east part of England, which is on a scale of 4 inches to the mile, even the vertical scale of that has to be increased to show the elevations through the weald of Sussex. It is necessary in that case to raise the scale ten times to show heights of even 500 feet. I had a long interview with Sir Samuel Baker, and he entirely agreed with the lecturer that it is necessary to have large models of this earth, and to have delineated on it, not only the rivers and roads with lines and dots for towns, but also the elevations and depressions which are the main features of the earth, which are entirely lost on the ordinary maps. I may also mention the remark of the late Duke of Wellington. He gave the case of moving his army on the continent. He intended to be at a certain place in a given time, and he calculated the distance according to the map, and he found that he was several hours late in arriving on account of the elevation not being shown, and might have had his army annihilated in consequence. I myself, as descending from both the Army and the Navy, think that such a globe as is proposed is necessary, and I shall only be too pleased to lend my assistance, in any shape or form, to further the scheme for the construction of a national globe.

The President: The paper we have listened to with so much interest has suggested many things, and amongst others that we should revert to the use of globes and to curved projections to a far greater extent. It would be reverting to them, because in former days globes were very extensively used throughout Europe. I was reminded, by what was said in M. Reclus' paper, of a great mathematician and a great geographer, with whose writings I have had much to do—Robert Hughes, who flourished in the time of Queen Elizabeth and James I., and this is what he said of globes. He spoke almost in the same words that have been used by M. Reclus: "A globe is a figure cut proper and apt to the fashion of the earth as being most agreeable to nature, easiest to be understood, and also very beautiful to behold." It was through his influence, and the influence of other mathematicians who flourished in Europe in the sixteenth century, that globes came so much into use. You can seldom look at the lists of the instruments of the old discoverers, without seeing one, and generally two or three, globes in those lists. Mathematicians taught people how to puzzle out almost every problem in practical astronomy by the use of globes, and this was done almost universally before the use of logarithms became known. They afterwards fell into disuse, but now M. Reclus brings to our attention the importance, as regards accuracy especially, of using globes and curved surfaces for all our maps. I trust that he may succeed in his great idea of the construction of a globe large enough to show all the inequalities of the surface of the Earth. We should be very glad to help him in this work. He has explained his project at this meeting with eloquence and with enthusiasm, combined with scientific sobriety, and I believe one way of helping him is that suggested by Prof. Geddes. I shall propose that a scientific committee be formed to assist and to co-operate with M. Reclus in his great attempt to improve the methods of constructing maps. I quite agree with him that it is a mistake, and is wrong, to distort maps by increasing the altitude of mountains. I remember many years ago a very large model of India was made, which was afterwards sent out to Calcutta, where the Himalayas were distorted to a ridiculous extent, and I think it merely tended to confuse those who used that model. I am sure you will now wish to pass a very hearty vote of thanks to M. Élisée Reclus for the most interesting paper which he has read to us.

THE MONTHLY RECORD.

EUROPE.

The Mennonite Colonies in South Russia.—The history and present state of the German Mennonite Colonies in South Russia is the subject of a paper by H. van der Smissen, in the eighth number of *Petermanns Mitteilungen* for the current year. The first settlers of this sect set out from the neighbourhood of Danzig in 1788, in response to the invitation of the Empress Catherine II., who offered many advantages to the colonists, including the free exercise of their religion and thirty years' immunity from taxation. They arrived at the spot chosen for the colony, near the junction of the little river Chortitza with the Dneiper, in July, 1789, and, in spite of many preliminary difficulties, a prosperous community became in time established, whilst by the introduction of the plough fruitful fields took the place of the steppes, which before had merely given pasture for cattle. Fresh colonists arrived from Germany, and in 1803–4 a new settlement was made on the Molochna, which, like the "old colony" at Chortitz, in time sent out offshoots into the surrounding districts. Flourishing settlements are to be found at the present day as far from the original colonies as Saratov on the Volga, and the neighbourhood of Stavropol in the Caucasus, and although a Russian form of government has now taken the place of the primitive organization, they remain German both in language and customs no less than in religion. A map, with descriptive letterpress by Paul Langhans, accompanies the paper, showing the situation and present statistics of the colonies, based on private information. In 1890 the number of German settlements amounted to 513, with a population of 310,342, and occupying together an area larger than that of Pomerania.

Re-opening to Navigation of the Elbing Mouth of the Vistula.—A note in *Globus* (vol. 74, No. 7) announces the re-opening as a navigable waterway, on July 1 last, of the Elbing branch of the Vistula, which debouches into the "Frische Haff." This channel was much used by vessels until 1840, when, owing to the breach made by the river near Neufähr, a great change ensued, the Elbing mouth becoming gradually silted up. Since 1895, owing to a new breach between Siedlersfähr and the Baltic, the conditions have become more favourable to the Elbing branch, and it has been possible, by the carrying out of the necessary works, to again throw it open to navigation.

Pine Forests succeeded by Oak Brushwood.—In a short note in *Globus* (vol. 74, No. 7), Dr. E. H. L. Krause shows that the conclusion sometimes drawn, from the existence at the present day of low oak woods on the Baltic coastlands, that these were formerly covered with true oak forests, is not necessarily correct. He instances a case where the destruction of a *pine* forest has resulted in the growth of *oak* brushwood. In the neighbourhood of Thorn, where about ten years ago a portion of forest was cut down for the enlargement of the fortress, the forest trees consisted of pines, while a low growth of oak, kept down to the height of a man, or even less, by the forest officers, in many places covered the ground. Since the clearing of the ground the oaks have quickly sent up shoots, while the pine stumps have decayed, and new seedlings are destroyed by goats and cattle.

ASIA.

The Expedition to Christmas Island.—Mr. C. W. Andrews, who was last year sent out to Christmas island by Sir John Murray for the purpose of making a thorough scientific examination of its physical features, has returned to England with valuable collections representing the zoology, botany, and geology of the island. The dense forest with which it is covered, the scarcity of drinking-water, and the swarms of rats and land-crabs put many difficulties in his way, but these were successfully surmounted, though it was found impossible ever to progress at a greater rate than 2 miles a day. Much light may be expected to be thrown on the geological history of the island by Mr. Andrews' investigations. The succession of coral bands round the central volcanic core seems to show that its elevation must have taken place at considerable intervals.

Mr. R. T. Günther's Visit to Lake Urmia.—Mr. R. T. Günther has this summer proceeded to Lake Urmia, in Persia, for the purpose of investigating the fauna of the lake. This, like the fauna of Tanganyika, possesses a special interest from the fact that a species of *Medusa* has been supposed to exist in the lake, a point of much importance in connection with the past history of this body of water. Writing to *Nature* on July 20, Mr. Günther announced that the organisms referred to by Mr. Curzon as "jelly-fish," which are met with in swarms near the shore, are crustaceans belonging to the order *Branchiopoda*. They appear to him to resemble the *Artemia* group of varieties of the *Branchipus* type, which are specially adapted for life in waters much charged with salt. The natives, who know these organisms well, deny the existence of any other animal in the lake, and Mr. Günther had been unable to detect any other vestiges of life in the salt water, except the larva of a fly, found in very shallow water, and an alga which floats freely in the lake.

Lieut. Olufsen's Expedition to the Pamirs.—Writing to the Paris Geographical Society on June 14 last, Lieut. Olufsen announced his safe arrival at Osh, in Ferghana, with a caravan composed of ten armed men and sixteen horses. He proposed to spend the greater part of the summer in the neighbourhood of Yashil-Kul and Gaz-Kul, proceeding to Wakhan in the autumn, and taking up winter quarters in Shugnan, where a meteorological station will be established on the banks of the Panj. The expedition is provisioned for a year.

The Mentawei Islands, Sumatra.—A short account of the Mentawei islands—a group lying off the west coast of Sumatra—was given before the Berlin Geographical Society in April last by Herr Alfred Maass, and is printed in the fourth number of the *Verhandlungen* for the current year. The principal object of Herr Maass' visit was the collection of ethnographical objects, especially skulls of the natives, about whose affinities some doubt exists, and the greater part of the paper is taken up with the account of their manners and customs, etc. The group consists of four principal islands of volcanic origin, but with generally flat surface. Herr Maass landed on the most northerly but one, known, among other names, as South Pora, or Tobolagai, taking up his quarters, with his companion Dr. Morris, on Siobau bay. Siobau is one of the nine villages on the island, and after some difficulties arising from the frequency of religious observances, during which the natives see no strangers, Herr Maass was able to pay a visit to it, and observe the people in their natural surroundings. The village consisted of three large and seventy small houses built on piles, and scattered without order in a forest clearing along the course of a stream. While some have held the natives to be of Polynesian, others of Malay stock, Herr Maass is inclined to think that they may be the remnant of an aboriginal population of Sumatra, but on this question some light may perhaps be thrown by the linguistic studies of Dr. Morris. They are of middle stature, are tattooed, and have long black hair with a shade of brown. They live chiefly by the chase and fishing, employing the bow and arrows for the killing of game; their attempts at cultivation are but slight. They are fetishists, the greatest object of veneration being a curved bamboo cylinder which is set up in the forest, adorned with flowers and leaves, and to which special attention is paid when a voyage is to be made. Communal ownership is not seen among them, private property being recognized, though much of the land is ownerless. The density of the primeval forest forbade the crossing of the island, and an attempted visit to the southern islands of the group was hindered by bad weather. Some botanical and zoological collections were made, special attention being paid to butterflies, of which sixteen new species were obtained out of a total of four hundred and fifty-one.

East Siberia.—Three important works have lately been published by the Russian Geographical Society in its Memoirs. All three are diaries which were kept during expeditions many years ago, but they have not lost their interest during the long years which have passed since these expeditions were made. Two of these volumes are diaries of the mining engineer, I. A. Lopatin, who travelled in the year 1865 in the northern parts of the Vitim plateau (vol. xxviii. No. 1), and next year along the Yenisei to Turukhansk (vol. xxviii. No. 2). For many reasons, one of which was the illness of the author, and the other was his desire to have all his geological collections well determined by specialists, these two diaries are only now published. Both were admirably kept, and are full of minute information as regards the topography and geology of the regions visited. During his Vitim journey, I. A. Lopatin remained all the time on the plateau, amidst the granites and gneisses and the old metamorphic slates, probably of Laurentian and possibly of Huronian age, in which no fossils have hitherto been found. The traveller made a very large collection of samples of the rocks which he met with, and this collection having been described by specialists, and the places where each sort of rocks was found being now marked on a map, the diary contains data which will be found very valuable to those who study these formations. I. A. Lopatin also describes the widely spread beds of basalts which cover that part of the plateau, and gives a great number of minute observations concerning their structure and the craters which are seen amidst them. He also saw here and there patches of conglomerates and limestones of undetermined age, as also patches of sandy superficial deposits, probably of Tertiary age. The diary of the Turukhansk expedition is much more interesting. The Palæozoic formations of the lower Yenisei seem to be disposed in a series of low ridges running from the south-east to the north-west, and are pierced by the river, which takes on these stretches a north-eastern direction. Silurian deposits occupy wide spaces on the lower Yenisei, and the fossils collected by Lopatin have been fully described by Friedrich Schmidt in his 'Mammoth Expedition.' Many boulders containing fossils of the Jurassic age are found along the banks of the Yenisei, but the rocks themselves were seen only at two spots. Traces of glaciation have only been observed by Lopatin in the shape of polished and scratched boulders, and a few scratched *roches moutonnées*, which the author was, however, inclined to ascribe to the action of the Yenisei ice. The Post-Pliocene marine deposits attain in the north a thickness of 140 feet, which decreases southwards. A considerable number of marine subarctic fossils (described by F. Schmidt in the above-mentioned work) were found in these deposits, which appear on the banks of the Yenisei, beginning in latitude 77° 30′. A geological map accompanies this very valuable diary. The third work is the diary of the expedition of A. L. Czekanovski on the lower Tunguska, Olenek, and Lena rivers, in the years 1873–1875. It contains an excellent portrait of that remarkable explorer of East Siberia, a map of part of his Olenek journey (his other maps and the astronomical determinations of his travelling companion, Fred. Müller, being already incorporated in the general staff maps of Siberia) and several drawings. In the introduction we find a biography of Czekanovski, who was exiled to Siberia after the Polish insurrection of 1863, and spent thirteen years there. Owing to the intervention of his friend and university comrade, Friedrich Schmidt, who visited him in 1866, Czekanovski was allowed to stay at Irkutsk and to make several journeys for the Siberian Geographical Society. In 1876 he was permitted to come to St. Petersburg, in order to work upon his rich palæontological collections, but he was soon ordered to return to Irkutsk, whereupon he put an end to his brilliant scientific career by taking a strong dose of ammonia. F. Schmidt has quite correctly appreciated the results of Czekanovski's expedition by saying that it was richer in geological results than any other expedition to Siberia. Its main results have at various times been referred to in all geographical serials. The rich collections of Jurassic and Tertiary plants which he collected, were described by Oswald Heer and Prof. Schmalhausen; the animal fossils from the Jurassic period were described by Prof. Lagusen; the Triassic by Mojsisowicz; and the Silurian by F. Schmidt. The plants collected by Czekanovski and Müller were fully worked out by Trautvetter, and his linguistic materials by Prof. Schifner. The Devonian fossils only from the lower Tunguska, and also the plants collected on the banks of that river and his petrological collections, have not yet been fully described. As to general descriptive accounts of Czekanovski's journeys, we had only what was contained in his preliminary reports. Consequently, the Russian Geographical Society has now published the full diary of that memorable expedition, prepared for print by Czerski and partly by F. Schmidt. It is needless to say that the diary is full of most valuable data relative to the nature of the regions visited.

AFRICA.

Surveys in the Algerian Sahara.—We have already alluded (*Journal*, vol. xi. p. 667) to recent surveys by French officers in the neighbourhood of Insalah, which tended to confirm M. Foureau's views as to the position of that place. Still another survey has this year been carried out by Captains Germain and Laperrine, along a route leading from Fort MacMahon to Ksar-el-Kebir, the most central of the group of "Ksur" of the Insalah district. A large-scale map embodying the results of this survey has been constructed by M. Vuillot, and is published in the *Bulletin de l'Afrique Française* for July last, accompanied by explanatory letterpress. The result of the new surveys is to show that M. Foureau was right in shifting the formerly accepted position of Insalah towards the east, but that the longitude which he deduced from his 1893 itinerary to Hassi-el-Mongar (also shown on M. Vuillot's map) was 17′ 40″ too far in that direction. The itinerary of Captains Germain and Laperrine completely alters the map of the region, which was based almost entirely on information collected by Commandant Deporter in 1890. Many of the features of the country have to be shifted considerably to the north, and certain of them as much as 25 miles to the east. The general direction of the successive terraces of the "Baten" is also completely altered.

Dr. Schoeller on his Journey in East Africa.—Dr. Max Schoeller, regarding whose journey in British East Africa (1896–97) some information has already been given in our pages, gave a brief account of the scientific results of that journey at a meeting of the Berlin Geographical Society in May last (*Verdhandlungen*, Nos. 5, 6). Regarding the ethnology of the region traversed, which formed Dr. Schoeller's special study, he is of opinion that nothing is to be gained, at present at least, by extensive subdivision of the tribes into groups, owing to the manner in which the customs, languages, etc., of neighbouring tribes pass into one another. Thus the Wa-Kikuyu, though Bantu, wear ornaments proper to the Hamites. The Nilotic tribes must, however, be provisionally placed in a separate group from the Bantu and Hamites, although it may be possible eventually to subordinate them to one or other of the main groups. The Hamites he considers to form but one group, which may be subdivided according to their occupation into Masai, Wakuafi and Wanderobo. The lands occupied by the Masai can never, in his opinion, be suitable for colonization, both on account of the opposition of the people themselves and because they have chosen as their home just those districts that are unsuitable for agriculture. The geographical details refer chiefly to the Natron lake and the districts of Sotiko and Lumbua (reached by following up the Guaso Nyiro from the lake), which, lying off the caravan route, have hitherto been little known. The Natron lake was to a great extent dried up at the time of Dr. Schoeller's visit, and its dark blue water was broken up into isolated lagoons. Into these some brackish hot springs poured their water, at temperatures varying from 84° to 102° Fahr. Much of the ground was occupied with extensive deposits of soda, which glistened like snowfields between the western valley-wall and the massive volcano Gelei on the opposite side. Following up the course of the Guaso Nyiro, the character of the landscape changed rapidly, steppe giving place to park-like country, and this to mountainous or hilly districts. In Sotiko and Lumbua the vegetation was extremely luxuriant, and the soil everywhere fertile, supporting a large population. Dr. Schoeller gave some account of the zones of vegetation passed through during the journey from the coast, as well as of the methods of survey adopted, the results in this direction being due to his companion, Herr Kaiser. He concludes with an appreciative estimate of the work accomplished by the British in Uganda.

Journey in Uha and Urundi.—A journey through some of the less-known parts of Uha and Urundi, in German East Africa, undertaken in 1895 by the fathers of the Catholic Mission station in Ushirombo, is described from the notes of Père Capus in *Petermanns Mitteilungen* (Nos. 6 and 8, 1898, with map). Passing through the small independent district of Utambala, the travellers next reached the dominions of King Rwaza, of Lunzewe, after crossing the river Nikonga, which terminates in swamps in the south of Uha. Rwaza's country has suffered much from the raids of the Bangoni (Zulus), but these have now been persuaded by the German authorities to give up their former mode of life, and, strange to say, have settled down as peaceful cultivators on the borders of Lunzewe under their chief Mupangalala. A permanent Zulu colony is, however, unlikely to be established, as the tribe is not a united one, and the chief daily loses followers by desertion, and has begun to show signs of restlessness himself. His residence, resembling a colossal cupola, astonished the travellers from its size. A large part of Lunzewe is taken up with *poris*, or thin woods, which alternate with savannahs and abound in game. On the side of Uha—from which it is separated by the southward-flowing Muyobozi, or Lukoki, a stream whose deeply cut bed was with difficulty crossed—

the country consists largely of uninhabited swampy plains, formerly, like the whole of Lunzewe, part of the dominions of the King of Uha. The present king, Kihumbi, of the race of the Bahuma, lives on bad terms with his neighbours, but is unable to recover the influence possessed by his predecessors, who even held sway over Urundi. His residence lies to the west of the Muhuazi, which, with several tributaries, drains the country southwards, apparently to the Malagarazi. The people of Uha are very superstitious, and their priests exercise a pernicious influence by means of the religious ban. Approaching the borders of Urundi, the travellers found the country more mountainous, giving the idea that the surface had been broken up by some vast catastrophe. On the west side of the Mbuli range, whose slopes were almost bare owing to the grass-burnings, the soil was much less fertile than in Uha; small streams, which become torrents during the rains, flow down in deeply cut valleys. Having, after some difficulty, obtained the leave of Rumonge, king of Urundi, for the establishment of a mission station near his capital, Père Capus returned to Ushirombo, across the southern districts of Uha, which form an almost uninhabited wilderness.

Train Service on the Congo Railway.—The *Mouvement Géographique* for September 11 publishes the regulations with respect to traffic on the Congo railway, lately issued by the company. Passenger trains leave either terminus of the line on Mondays, Wednesdays, and Fridays, halting for the night at Tumba, and reaching their destination on the evening of the following day. First and second-class tickets are issued, but the latter merely give the right to travel by goods waggon. First-class passengers are allowed the free conveyance of 100 kilogrammes of luggage. The first-class fare over the whole length of the line is 500 francs, the return ticket (available eight days) being half as much again. Second-class tickets cost exactly one-tenth of these amounts. The fare per mile for first-class tickets is thus slightly over 1*s*. 7*d*., as compared with about 6*d*. on the Uganda railway.

The Jigger at Zanzibar.—Under the title of "The Latest Crossing of Africa," Dr. Oscar Baumann announces, in a short communication to *Petermanns Mitteilungen* (1898, No. 7), that the "jigger," introduced, it is supposed, into West Africa from Brazil in 1872, has in a quarter of a century made its way right across the continent to Zanzibar. In 1885 Dr. Baumann found the pest at Stanley pool, but it had not then reached the upper Congo. In 1892, however, it had already arrived at the western shore of the Victoria Nyanza, having, it is said, been brought thither by Stanley's expedition; it had also reached Tanganyika by way of Manyema. In 1895 it had made its way to Mpwapwa, and two years later to the East Coast, whilst it has since appeared in Zanzibar island. In the interior its ravages have been tremendous; but on the coast they are less severe, as the proper treatment is there understood.

The First River-steamer in German East Africa.—The supplement to the *Deutsche Kolonialzeitung* for June 16 last gives a description, with illustration, of the river-steamer (the *Ulanga*) which has been sent out in sections and put together on the Rifiji river, on the waters of which it is intended to ply. It is the first steamer which has been placed on the rivers of German East Africa. It is a stern-wheeler, with main and upper decks, the whole covered over by a light wooden awning. In addition to the quarters for captain and crew, accommodation has been provided for three passengers. The length at the water-line is 108 feet and the greatest breadth 22 feet.

German South-West Africa.—At a meeting of the Baden section of the German Colonial Society, held at Freiburg on May 6, Major Leutwein gave an account of the present state of the colony, and described the various difficulties which had been encountered by the Germans in establishing their influence over the natives. Although, nominally, the German authority extended over the Nama Hottentos in the south, and the Hereros in the centre, it is in reality exercised only over the district between Windhoek and the coast. The Ovambos still show a marked distrust of Europeans. The entire population is estimated at 300,000, with 3000 whites at Windhoek. The efforts of missionaries have introduced a somewhat higher civilization among the natives, many, even of the Hereros, being Christians, adopting European dress, and speaking Dutch. Major Leutwein gave some account of the operations against the Nama chief, Witboi, who is now a firm friend of the German Protectorate. The rinderpest has proved a great misfortune for the colony, though by Dr. Koch's method of inoculation, 70 per cent. of the cattle have been saved. Cattle-rearing is only profitable on a large scale, a capital of £500 to £1000 being needed at first. Irrigation works are much needed. A most important question is the supply of women colonists, in order to avoid the evils of intermarriage with the natives. Major Leutwein insists on the need of taking out women from Germany.

A Botanical Garden for Uganda.—Mr. Alexander Whyte, whose botanical labours in Nyasaland since the establishment of the British Protectorate are so well known, has been entrusted by Government with the task of proceeding to Uganda for the purpose of establishing a botanical and experimental garden there. Much may be hoped from his labours in the way of investigating and development of the agricultural resources of that country.

Exploration in the Bangweolo Region.—With reference to Mr. Weatherley's paper on "The Circumnavigation of Lake Bangweolo," Mr. Demetrius Boulger calls our attention to the important work done by Belgian explorers in the region in question, particularly by the Bia-Francqui expedition, by the members of which the bronze tablet to Livingstone's memory was erected at Kitambo. It may be observed, however, that the attention of the meeting was primarily addressed to Lake Bangweolo as a geographical unit, and that the Belgian expedition, which did not approach within 40 miles of the open water of the lake, necessarily threw no new light on its geography. Our map was not intended to show the routes of all travellers in the region, but merely of those whose journeys had been of importance in the history of the exploration of the lake.

AMERICA.

Chilian Corcovado Expedition.—The exploration of the Western Patagonian Cordillera continues with unabated activity. Early in April the expedition, which set out from Chili in January, under the leadership of Drs. Paul Krüger and Ernst Rethwich, for the exploration of the Corcovado river, returned to Santiago de Chile after accomplishing a most successful piece of work. Some details respecting it are given in *Globus* (vol. 73, No. 23) and in *Petermanns Mitteilungen* (1898, No. 7). During the previous season the Cordillera had been crossed in 42½° S. lat., and the continental water-parting towards the headstreams of the Chubut had been explored. This year the task chosen was the exploration of the Cordillera south of 43°, and of the completely unknown Corcovado river, which, with three others, empties itself into the sea a little south of that latitude. The exploration of the river was carried out in a rowing-boat. In its lower course it has the character of a clear forest stream, about 300 yards wide, with a considerable volume of water. Higher up it narrows to 100 yards and less. Progress was rendered slow and dangerous by the rapids and sandbanks and by the sudden rise of the river. Two narrow gorges were met with on its upper course, the bed of the stream being narrowed to 20 or 30 yards, while the cliffs on either hand are nearly impassable, and clothed with dense vegetation. At the second gorge the expedition was stopped by a deluge of rain, which lasted three days and caused the flooded river to carry down great stones with thundering noise. On February 25 the valley broadened out, but was blocked by a great glacier, whence the river has its origin. It has, therefore, a comparatively short course, its basin being bounded eastward by a steep bare range running from north to south at about 30 miles from the coast. Near 43° it forms an unbroken snowy chain, which bars all progress eastwards. The Futaleufu, a considerable stream flowing in a longitudinal valley, which had been discovered the year before, has no connection with the Corcovado, the three principal tributaries of which were traced to glacier sources. An excellent map of the whole Andean region which has been the scene of recent explorations, is given in the *Annales de Géographie* for May 15, based on the map issued by the La Plata Museum in 1896.

Journey of Dr. Karl Sapper in Honduras.—Dr. Karl Sapper, well known for his geographical work in Central America, has lately communicated to the Berlin Geographical Society some details regarding a journey in Eastern Honduras, undertaken by him early in the present year. After a visit to the mining centres of Santa Lucia and San Juancito—the latter possessing the most prosperous mines in all Central America—he followed the direction of the mountain range by Jutigalpa and Catacamas to the district of the Paya Indians, and thence to Trujillo. The mountains in this region were generally low, not by any means equalling those of Western Honduras. Trujillo has recently lost much of its importance, owing to the transfer of a large part of its trade to Ceiba and Puerto Cortez. In its neighbourhood there are large villages of Caribs, who speak a language containing a large admixture of French, English, and Spanish words. Hence he crossed the coast-range by a low pass, and returned to Tegucigalpa by the valley of the Aguán and the pack-road *viâ* Cedros. Dr. Sapper found the means of communication worse, and the population much more scanty in Eastern than in Western Honduras. The greater part of the people is of mixed descent, with a large admixture of negro blood. Geologically Eastern Honduras is marked by the preponderance of the older eruptive and crystalline rocks over the more recent, which play so important a part in the west. Pine and oak woods predominate on the heights, dry forests, savannahs, etc., in the lowlands. Moist tropical and subtropical forests are found only on the Atlantic coast and a few mountain summits in the interior, except in the extreme east (Mosquitia) where primeval tropical forest is said to prevail everywhere.

The Resources of the West Indies.—One outcome of the Royal Commission of inquiry into the condition of the British West Indies has been the creation of a new Botanical Department under the Imperial Government, which has been placed under the charge of Dr. D. Morris, lately assistant-director of the Royal Gardens at Kew, as Commissioner of Agriculture. Dr. Morris has proceeded to the West Indies to take up his duties. A recent number of the Kew *Bulletin* contains the appendix on the Economic Resources of the West Indies, contributed by Dr. Morris to the Report of the Commission, and embodying the results of his personal investigations. It is really a detailed account of the commercial geography of the British West Indies and British Guiana, a separate chapter being devoted to each island or colony. The soil, climate, natural resources, and chief agricultural produce of each are carefully summarized, with references to means of internal communication and inter-island trade. The fact that sugar-cane has hitherto been practically the only agricultural product to which serious attention has been paid throughout the West Indies has brought about the present serious economic crisis as a consequence of the competition of beet-sugar. Local efforts have not been wanting to introduce fresh staples, and the cacao of Trinidad, the cacao and spices of Grenada where the sugar industry is practically extinct, the limes of Dominica and Montserrat, and the varied fruits of Jamaica are all of importance. Botanical stations under the various colonial governments have done a good deal in the way of experimenting with and introducing new products from other tropical countries. Dr. Morris advocates the more systematic organization of the botanic gardens, the combination with them of training schools for practically instructing selected natives, and so improving the methods of cultivation and the increase of facilities for export by improving roads and subsidizing additional lines of steamers. The fertility of the islands is so great, and the population so dense, that no doubt of the success of the new department under Dr. Morris can be entertained, and with this natural wealth wisely utilized, the West Indies ought to recover much of their old prosperity.

Ascent of Illimani by Sir Martin Conway.—Telegraphing to the *Daily Chronicle* from La Paz, on September 14, Sir Martin Conway announced his successful ascent of Mount Illimani (22,500 feet) on the 9th of that month. The ascent from the highest point of cultivation occupied five days, during three of which the party had the assistance of Indians as baggage-carriers, but these deserted on the fourth day. The last part of the ascent was made by a long ice-wall and across a huge snow-plateau, leading finally up a snow-ridge to the summit. During the last hour great weakness, but no actual illness, was experienced. Sir Martin Conway was about to start for Illampu (Sorata), sometimes supposed to be the highest summit of the Andes. He proposes to return to the coast at Antofagasta, and proceed by sea to Valparaiso, crossing the continent thence to Buenos Ayres.

The United States.—The latest addition to Stanford's 'Compendium of Geography and Travel' is a compact volume on the United States,* by Mr. Henry Gannett, the well-known geographer to the United States Geological Survey. The first chapter, entitled "General View of the Continent," gives a clear summary of the natural features of the United States, which is followed by brief descriptions of the climate, fauna, flora, mineral resources, population, social conditions, great cities, Indians and their remains, extent and area of the United States, history, government, agriculture, manufactures, transportation and commerce, and, lastly, Alaska. The subjects are treated in the order given above, and in large measure statistically. The facts are accurately recorded, and in the descriptive passages quotations from original authorities, such as Powell on the Grand Cañon of the Colorado, and Gilbert on Niagara Falls, are effectively introduced. Many of the paragraphs deal with aspects of the United States which are rarely treated systematically, and the work is everywhere thoroughly up to date. The difficult question of the population is admirably handled, and Mr. Gannett succeeds in giving an account of the history and institutions of his country without a boastful word. The illustrations are from original photographs, selected with great care, and each one illustrates some geographical fact. Special reference must also be made to the maps, which are numerous, clear, and very suggestive, illustrating both the physical and the demographical geography of the United States.

AUSTRALASIA AND PACIFIC ISLANDS.

Sir Wm. Macgregor's Second Journey across New Guinea.—In a despatch dated January 26, 1898, Sir Wm. Macgregor describes his second journey across British New Guinea, made in the reverse direction to that of 1896. The journey, which occupied fifty-one days, was hurriedly organized for the relief of a prospecting party beleaguered by hostile natives near the west end of the Owen Stanley range, and, being made at an unfavourable time of year, involved many difficulties and discomforts, chiefly from rain and cold; but some valuable surveying work was accomplished. After relieving the beleaguered men, the Lieut.-Governor proceeded to the camp established by Mr. Giulianetti on Mount Wharton, as described in our last number. The country through which the Vetapu flows is exceedingly mountainous, and that river and its branches have cut for themselves narrow and deep glens between the great peaks. The mountain slopes are mainly grass-covered up to 4000 to 6000 feet, but their summits are forest-clad. Owing to the steepness of the sides of the glens, the natives gradually push upwards to obtain virgin forest soil for cultivation. From the top of the Wharton range, the course of the Vetapu could be traced north and north-east for a considerable distance. The northern boundary of its valley seemed to be the mountains which separate it from the Angabunga. Towards the north and north-west the country is full of forest-clad mountains, but none was seen higher than Mount Yule. A good view was also obtained later on from Mount Scratchley: the Yodda valley, which begins at the foot of that mountain, runs for some distance parallel to the central range, finally merging in the Musa valley, which is shut in at the far end by the great mountain of Goropu. Yule island could be seen in the south, and the coast of the German territory on the other side. Animal life on these great mountain-tops proved scarce, birds even being few. The journey was continued to the government station on the Mambare, and down that river to the north coast. The reports of the gold prospectors in this district were not encouraging. Sir Wm. Macgregor insists on the importance of opening a path across the main range at a point where its elevation is lower, the route followed being difficult and exhausting, especially to the coast carriers, who are unfit for the high altitudes.

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* Stanford's 'Compendium of Geography and Travel' (New Issue), North America, vol. ii.: 'The United States,' by Henry Gannett, Chief Geographer of the United States Geological Survey. Maps and illustrations. London: Edward Stanford. 1898.

Exploration by Catholic Missionaries in British New Guinea.—The Roman Catholic missionaries established on the south coast of British New Guinea, to whom was due some years ago the discovery of the St. Joseph river, which flows into the sea opposite Yule island, have lately carried out further explorations in the country lying behind their sphere of operations (*Comptes Rendus*, Paris Geographical Society, 1898, p. 206). MM. Jullien and De Rycke left Vanuamae in August, 1896, and, passing through extensive forests, explored the headwaters of the Aroa, a stream which débouches into the north of Redscar bay. It is formed by the junction of two main branches, the Kubuna and the Veida, the latter of which was ascended, until, on reaching the mountains forming part of the Owen Stanley range, an important group of villages was reached, inhabited by a much more intelligent and energetic race than that of the coast. They are agriculturists, and build their villages on the top of steep eminences, the houses being conical in shape. Mount Manaku, a little to the east, has a height of over 6000 feet. On a second journey, a year later, the Fathers ascended the Kabuna through a mountainous country, and, beyond a narrow ridge over 3000 feet high, came upon the upper course of the St. Joseph river, which flows round the south side of Mount Boboleva (Davidson of English maps). Passing several villages, the travellers discovered the confluence of the two upper branches of the St. Joseph, the one coming from the direction of Mount Albert Edward (Umi Lebule) in the east, the other from the north, in which direction is a high mountain (Umi Manaia) not hitherto shown on our maps. It seems to reach a height of over 14,000 feet, and to be the culminating-point of a long chain running north-west. To the south-east there is a slightly lower mountain group. Some high mountains near the source of the eastern branch of the St. Joseph are said to give rise to the Mambare, which enters the sea close to the Anglo-German boundary on the north coast. The whole region is filled with rugged mountains, taking the form of narrow parallel chains. Above 6000 feet the vegetation consists of cedars, pines, tree-ferns, oaks, etc. Many species of birds of Paradise are met with.

POLAR REGIONS.

Mr. Wellman's Polar Expedition.—Mr. Wellman's ship, the *Fridtjof*, has returned from Franz Josef Land, bringing news of the expedition down to August 2. Writing to us on that date, the leader announced the landing of his party at Cape Tegetthoff, and his proposed start for the north a few days later. The voyage to Franz Josef Land had been a successful one. After ten days in the ice, Cape Grant was reached on July 27, Cape Flora on the 28th. Here the ship was turned back by ice, reaching Cape Tegetthoff on the 30th, after which the tour of Wilczek and Salm islands was made before the final landing was effected. A house, named "Harmsworth House," as the inner shell was taken from Cape Flora, had been erected at Cape Tegetthoff, but, in spite of the temptation to winter there, Mr. Wellman hoped to be able to adhere to his original plan, and push northwards to Crown Prince Rudolf Land, wintering there in an improvised hut of stones and snow. The house at Cape Tegetthoff would be of use to fall back upon in case of need.

The German Expedition to the Arctic Seas.—The *Helgoland*, Captain Rüdiger, with the German Arctic Expedition under Herr Theodor Lerner on board, returned in August to Hammerfest, without having discovered any traces of Andrée's expedition. Some geographical work has been accomplished in the neighbourhood of Kong Karls Land, which, according to published statements, was found to consist of three islands, viz. Swedish foreland, Jena island, and a third lying in the centre, which was named August Scherl, after the promoter of the expedition. This is at variance with the account of Mr. Arnold Pike, who, it will be remembered, maintained that there is but one island in addition to Swedish foreland, which last is not usually included under the name Kong Karls Land. In spite of much ice and unfavourable weather, a passage was forced by the *Helgoland* round the eastern coast of the islands, and a latitude of 81° 32′ reached, *viâ* the east coast of North-East Land, the pack-ice then preventing further advance. Successful dredging operations were carried out to the north and east in depths of over 600 fathoms. On August Scherl island the breeding-grounds of the ivory gull were met with.

The Swedish Andrée Search Expedition.—Quoting from the *Aftonbladet* of Stockholm, the *Mouvement Géographique* (August 21) announced the arrival of M. Stadling, leader of the Andrée Search Expedition, at the mouth of the Lena. The expedition had visited the New Siberian islands, as also the neighbourhood of the Anabara and Indigirka rivers, without finding a trace of the missing explorer. M. Stadling was about to proceed to the Taimyr peninsula *en route* for the Yenesei. The same paper also announced that the Norwegian navigator, M. Brækmœ, had undertaken a journey to the New Siberian islands in order to find out whether the provisions left by Baron von Toll remain intact, but from a recent telegram it would seem that he has returned without accomplishing his object.

Pendulum Observations in Spitsbergen.—Although unable to visit Franz Josef Land, as he had originally planned, Prof. J. H. Gore proceeded this summer to Spitsbergen in order to carry out pendulum observations for the determination of the force of gravity in that high latitude. He has now returned, having spent several days on Danes island, making there an elaborate series of observations of the character contemplated, with the instruments of the U.S. Coast and Geodetic

Survey. Results were also obtained at Tromsö and Leyden, which stations, together with that at Washington, will form part of a series, approximately equidistant, which Prof. Gore hopes to extend southwards to the equator, covering 80° of latitude. In spite of a careful search, not a trace was found of anything which might throw light on Andrée's fate. His balloon-house was a complete wreck.

Lieut. Peary's Expedition.—The steamer *Hope*, which took coal and other supplies northwards for Lieut. Peary's expedition, returned from Greenland at the end of August, having parted from the *Windward* at Port Foulke, at the entrance to Smith sound. Lieut. Peary writing to us from Etah, August 13, states that the season as far north as Cape Sabine is a late one; he was just starting for the attack on Kane Basin and the channel above. So far his plans had progressed favourably. He had on board ten picked Eskimo (five couples), about sixty dogs, and the carcasses of sixty walrus.

Polar Exploration by Means of Ice-Breakers.—At a recent meeting of the Russian Geographical Society Admiral Makaroff submitted a proposal of reaching the pole by means of powerful ice-breakers. Steamers specially built for breaking the ice were first resorted to in Russia, in 1864, by the engineer Britneff, for breaking the ice at Kronstadt. Lately, ice-breakers have been very much improved in the United States, where the happy idea of providing steamers of that sort with twin screws at the stern, and a third screw at the stem, has proved to considerably increase their breaking powers. More recently, powerful ice-breakers have been constructed in the States and in England (by Armstrong) for Russia, for transporting the trains of the Siberian railway across Lake Baikal, and for keeping the port of Vladivostok clear of ice. Experiments were made with such steamers, and altogether the theory of ice-breakers was worked out. It appears that on the American lakes, the ice-breaker, *Ste. Marie*, 3000 horse-power, armed with a screw at the stem, easily makes her way through ice, 2½ feet thick, and pierces, when necessary, ice-walls, 15 to 20 feet high; and Russian engineers have calculated that, in order to sail through quite sound ice, 12 feet thick, an ice-breaker of 52,000 horse-power would be required. Such a steamer would also be able to cut its way, though at a slower speed, through ice-walls, which, as it appears from Nansen's experience, very seldom attain a height of 25 feet in the polar basin. A steamer of 52,000 horse-power would certainly be a very great enterprise, although we have already in the Atlantic liners some steamers of 28,000 indicated horse-power. But as a polar expedition would only sail in summer, when the resistance of the ice is considerably diminished, and there is no snow on its surface, Admiral Makaroff shows that a much smaller ice-breaker would be sufficient. In summer, the ice in the polar basin is very much weakened by the channels originating from the accumulations of salt, and, moreover, one-third, at least, of the area to be sailed through must be, according to Nansen's testimony, free of ice. Taking all that into consideration in a quite scientific way, Admiral Makaroff comes to the conclusion that a steamer of 20,000 horse-power would be quite sufficient, and makes the following approximate calculation: From latitude 78°, where the ice-cover begins, to the pole, the distance is 720 miles. Assuming that one-fourth part of it is ice-free, the ice-breaker would cover this ice-free portion at a speed of 12 knots. One-fifth part of the total distance (*i.e.* 144 miles) may be covered with ice one year old, which would be 7½ feet thick in the winter, but would have lost by thawing about 3 feet, and would thus have in summer the thickness of 4½ feet, out of which thickness about 20 per cent. must be deducted on account of the crevices and the salt channels in the ice. Its real resistance would thus correspond to the resistance of sound winter-ice 3½ feet thick, which a 20,000 horse-power ice-breaker would pierce at a speed of

4 knots. Applying the same reasoning to two-year-old ice, and so on, Admiral Makaroff finds: another 120 miles of such ice, as equivalent to sound ice, 4¼ feet thick, speed of progress 3 knots; 120 miles of ice, 5½ feet thick, speed 2 knots; 120 miles of ice, 7 feet thick, speed 1·3 knots; and 36 miles of ice-walls, pierced at a speed of three-quarters of a knot. The whole distance of 720 miles could thus be covered in a little over twelve days, at an average speed of 2·4 knots. Moreover, experiments recently made in Russia have proved that, instead of making one ice-breaker of 20,000 horse-power, it would be advantageous to have two ice-breaking steamers of 10,000 horse-power each, it having been ascertained that two ice-breakers, placed one behind the other, and the after one pushing the other by means of a special wooden frame attached to the stern of the latter, have the same ice-breaking force as one steamer of a double force. With two ice-breakers, 6000 tons and 10,000 horse-power each, Admiral Makaroff is sure that the north pole could easily be reached.

Icebergs in the Southern Ocean.—We have received a reprint from the *Journal* of the Royal Society of New South Wales, of a second paper by Mr. H. C. Russell, on the "Icebergs of the Southern Ocean." The first paper, published in 1895, dealt with all the information collected up to July of that year, and the reports here discussed continue the record to September, 1897. The frequency with which icebergs are reported on the Cape-Australia route is investigated in relation to prevailing winds, and the provisional conclusion is arrived at that "when there is a prevalence of north-west winds no ice is reported, and with southerly winds plenty of ice is reported." The weak point of the conclusion is that the icebergs are 3000 miles distant from Australasia, where the winds are observed, and it is possible there may be an accidental relation between the position of the bergs and the direction of winds. From an inquiry into the general movements of the atmosphere between the Cape and Australia, made some years ago, Mr. Russell thinks this is scarcely possible, but he remarks that, while further observations are being collected, "it would materially aid the proof if any vessels sighting icebergs on a fine day with strong northerly or southerly winds, would stop the engines and watch the berg carefully for three or four hours to see if it does move with the wind. As soon as the motion with the wind is definitely determined by actual observation of the bergs, it will be possible, by careful study of the winds in South Africa and Australia, to forecast the positions of icebergs between Africa and Australia with some degree of exactness."

Mr. Borchgrevinck's Expedition.—Mr. Borchgrevinck's Antarctic Expedition sailed on August 22 in the *Southern Cross*, and its safe arrival at St. Vincent has since been announced.

GENERAL.

Two Books on Anthropogeography.—Two books have recently been published in France bearing on two separate and important aspects of the relation of man to the Earth. Prof. Auerbach, of Nancy, known for his excellent treatise on Lorraine and other geographical works, has made a special study of the racial geography of Austria-Hungary,* in which he enters into the question of what really determines a race, a nation, and a state. The result of the discussion is to show that nationality is a complex growth, in which common descent, a common language, and a common religion have all been factors, but no one of them essential.

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* 'Les Races et les Nationalités en Autriche-Hongrie.' Par Bertrand Auerbach. Avec cartes. Paris: Felix Alcan. 1898.

Various nationalities may subsist in one state, but difficulties inevitably arise when any one nationality attempts to bring the others under subordination. The different provinces of the empire are treated separately with regard to the races inhabiting them and the peculiarities of settlement or colonization of the dominant race. The conclusion come to by the author is that the tendency of the Hungarian crown towards the enforced incorporation of the minor nationalities, is less likely to lead to the establishment of permanent equilibrium than the Austrian policy of according to the minor nationalities a considerable share of local government with free use of their own languages. A confederation of racial units is pointed to as the most stable form for so heterogeneous a state as Austria-Hungary. The book is illustrated with a very clear ethnographical map in colours, and a number of sketch-maps and diagrams. The second book deals with a kindred but quite distinct subject. Instead of studying the varieties of race in a heterogeneous state, M. Demolins[*] gives his attention to the influence of environment in producing varieties in a homogeneous people. His present volume deals with the south and the centre of France, another is promised treating of the north. His thesis is that the principal factors which determine the difference between a Norman and a Provençal, for example, are place and occupation. Other factors come into operation, but they are of minor importance. Occupation of itself produces distinct social types, the pastoral, agricultural, industrial, etc., but the shepherds and farmers of one region differ, on account of the character of soil and climate, from those of another. These principles are illustrated by a number of striking facts, and the whole theory is set forth with captivating clearness. The zone of pastoral occupation is first considered, and three distinct types of social life are described—those of the pastures of the high mountains (Alps and Pyrenees), of the calcareous plateaux of the Causses, and of the volcanic rocks of Auvergne. Pastoral life tends to produce the patriarchal social type, the families embracing several generations with community of property, but the degree varies, and in Auvergne the wiles of cattle-dealing have given rise to a transition to the commercial mode of life. Next the zone of fruit trees is considered, divided into those where the chestnut, the olive, and the vine respectively prevail. Here the social life is less communal and more individual, while the easier conditions of making a living induce a lower moral tone. The zone of small agricultural holdings is that typically found in valleys, where the irrigated meadows bordering the stream, and the fertile alluvial soil of the lower slopes lead to the minute subdivision of the land and to corresponding social arrangements. The valleys of the regions of the Rhone, Garonne, and Loire are separately considered. The zone of large farms is next taken, and this is shown to correspond with the plateaux intermediate between the mountains and the valleys, and necessarily more extensive than either. The plateaux of the Rhone, the Garonne, and the Loire basins are considered in turn, and the special social types associated with them are distinguished. Finally, a special chapter is devoted to the granitic plateau of Brittany, but here the element of race also comes into play, and M. Demolins illustrates his arguments by many comparisons with the Irish and Highland Celts. The method of study here set forth promises to be of great value in geographical investigations, at least in the study of regions where the people have had time to bring themselves into harmony with their physical environment.

College of Commerce at the University of California.—A new departure, which should lead to useful results, has been taken by the Board of Regents of the

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[*] 'Edmond Demolins, Les Français d'aujourd'hui. Les Types Sociaux du Midi et du Centre.' Paris: Firmin-Didot et Cie. [Not dated.]

University of California, in the establishment, in January last, of a "college of commerce" in connection with the university. A pamphlet has been issued, setting forth the proposed scope and character of the college, and the provisional arrangements for 1898–99. It is intended to afford an opportunity for the complete study of commerce from a scientific point of view, and for the higher education of business men and members of the civil service. The studies will therefore embrace a broad range of subjects, such as international and commercial law, political economy, technology of the materials of commerce, history of commerce, geography in all its branches, modern languages, history, mathematics, etc. A large number of special courses already supplied by the university will be available to students, who may thus prepare themselves for almost any line of commercial activity. A chair of geography has lately been established at the University of California, and this was in March last offered to our honorary corresponding member, Prof. George Davidson, who entered upon his duties in July.

Drinking-water in the Tropics.—The eighteenth number of the *Mouvement Géographique* for the current year contains an abridged report of a lecture by M. Bergé before the Société d'Études Coloniales on the use of drinking-water in hot countries. The means ordinarily employed for the purification of water, boiling and filtration, are, M. Bergé points out, inadequate for the entire destruction of microbes, while boiling has the disadvantage of lessening the supply of oxygen which renders the water digestive. The procedure recommended by M. Bergé is an entirely new one, and consists in the sterilization of water by means of peroxide (binoxide) of chlorine. Although extremely unstable, and even explosive in its undiluted form, a dilute solution prepared at a low temperature can be used without danger, and will keep a long time if placed in a cool place and protected from light. Its cost is exceedingly small, and one part of the dilute solution will completely sterilize over two hundred parts of water, giving it no unpleasant taste. The binoxide of chlorine, which is formed by the reaction of sulphuric acid on chlorate of potash, can be manufactured by any one by the help of a simple apparatus, of which a sketch is given. A current of air is driven by a pair of bellows through a mixture of the above-mentioned substances, and the gas evolved is passed off by a tube into a bottle containing the water to be sterilized or the liquid which is to serve as its vehicle. It is hoped that this new process may become of great service to health in hot countries.

Practical Geography in Schools.—In the May number of the *Journal of School Geography*, Prof. W. M. Davis gave a detailed account of the equipment of a geographical laboratory for use in a school where a special room can be set apart for the purpose. He deals in detail with the fittings for storing and exhibiting maps and pictures and displaying lantern views, and indicates the best maps to use as specimens for showing the various types of land-forms. One large and a number of small hand globes are prescribed, and a battery of blackboards, some having outline maps painted upon them for use in demonstrations. A special feature is made of the gradual collection of a series of representative models or reliefs, and a collection of the commoner rocks and minerals also occupies a place. Work-tables are to be placed in a good light for carrying on practical work with maps and the preparation of models, etc. Arrangements are made for simple observations of the altitude of the sun, for the study of meteorological phenomena and of the weather maps—the latter, by the way, being supplied to schools free of charge in the United States. The article, although primarily intended for teachers in the United States, will well repay study by teachers in this country.

The Adventures of Colonel Alexander Gardner.—Sir Richard Temple writes an introduction to the biography of the hero of one of the most remarkable romances of real life.[*] Alexander Gardner, the son of an emigrant from Scotland, was born in Ontario in 1785, and, his mother being half Spanish, was educated partly in Mexico. Afterwards he spent some time in Ireland; in 1812 he visited Madrid, and in the following year journeyed to Astrakhan, where his brother was employed in the Russian service. He went by Cairo, and through Syria to Trebizond, and applied himself to the study of geology and chemistry, to qualify for a post as inspector of mines in Russia. Disgusted with his prospects, he went to Persia in 1818, and for twelve years he wandered as a soldier of fortune through all the lands of Central Asia, taking part in the wars between Afghan princes, often a fugitive, and sometimes a freebooter. He traversed the Pamirs and all the leading states, travelled through Kafiristan and the Bolor ranges. The reference to Bolor leads Major Pearse to discuss the existence and position of the place referred to by that name, concerning which there has been much controversy. The conclusion arrived at is that Bolor simply is the Persian word *bálá*, meaning upper or above, and is applied to any high country by the people living at a lower level. At length Gardner reached Peshawar, and passed into the service of Runjit Singh. He served various Sikh rulers as colonel of artillery, and at length retired on a pension to Srinagar, where "he dreamed his life away," dying in 1877, in his ninety-second year. The numerous notes and manuscripts kept throughout his career were left in a fragmentary condition, but Sir Henry Rawlinson, Sir Henry Yule, Mr. Ney Elias, and other masters of Eastern geography, had no doubt as to the substantial accuracy of the story of his travels. They were looked upon with suspicion by many people, until numerous details were substantiated by other travellers.

War and Geography.—In a recent number of the *Journal of Geography*, Prof. T. C. Chamberlin, of Chicago, points out that the war between the United States and Spain might be expected to produce a great revival of interest in geography and in geographical education throughout the former country. He concludes, "The actual contact with geographic and geologic phenomena into which the hundred thousand young men, more or less, will be brought as a result of the impending campaign will be to them, and through them to others, a geographic education of no little moment. It was observed at the close of the Civil War that those who returned from its campaigns possessed an appreciation of the elements of position and physical relationship quite beyond that realized by the preceding generation educated under the benign influences of peace. These incidental contributions to our favourite sciences and to those elements of education which are associated with them will be among the compensations to be set over against the calamity of war."

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

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[*] 'Soldier and Traveller. Memoirs of Alexander Gardner.' Edited by Major Hugh Pearse, with an introduction by Sir Richard Temple. Edinburgh and London: Wm. Blackwood & Sons. 1898.

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps. **Rainaud.**
Note sur la division des Alpes Franco-Italiennes. Par A. Rainaud. Lyon : Imp. Mougin-Rusand, 1898. Size 10 × 6½, pp. 14.

A reprint from the *Revue Alpine* for April, 1898, proposing to simplify the three divisions of the Franco-Italian Alps so as to view the Maritime Alps as terminating in the massif of Cuchastraye, the Cottian Alps in the massif of Tabor, and the Graian Alps in the massif of Mont Blanc.

Alps. *Die Natur* **47** (1898): 337-340. **Wagner.**
Die Alpenflora in ihren Beziehungen zum Klima. Von Paul Wagner.

Alps. *Ann. G.* **7** (1898): 308-328. **Zürcher.**
Le relief du sol dans la partie méridionale des Basses-Alpes. Par M. Ph. Zürcher. *With Map and Plates.*

Andorra. *Deutsche Rundschau G.* **20** (1898): 407-412. ———
Die Andorranische Frage. *With Map and Illustration.*

The question of the mutual rights of France and Spain over Andorra is here discussed.

Austria. *Fortnightly Rev.* **64** (1898): 56-71. **Hirst.**
A dissolving Empire. By Francis W. Hirst.

Austria—Bohemia. *Rev. G.* **42** (1898): 466-471. **Auerbach.**
La Question des Tchèques et des Allemands en Bohême d'après le livre récent de M. Bertrand Auerbach.

Austria—Carinthia. *Riv. G. Italiana* **5** (1898): 306-313. **Marinelli.**
La Carnia in generale. Di G. Marinelli.

On the position and extent of the territory to which the name *Carnia* has been applied.

Austria—Graz. **Hann.**
Ueber die Temperatur von Graz Stadt und Graz Land. Von J. Hann. (Aus den Sitzungsberichten der Kaiserl. Akademie der Wissenschaften in Wien. Mathem.-naturw. Classe; Bd. cvii. Abth. ii. a. Februar 1898.) Wien, 1898. Size 10 × 6½, pp. 16.

Austria-Hungary. **Auerbach.**
Les Races et les Nationalités en Autriche-Hongrie. Par Bertrand Auerbach. Paris: F. Alcan, 1898. Size 9 × 6, pp. 336. *Maps. Presented by the Publisher.*

A note on this volume will appear.

Austria—Isonzo. *Riv. G. Italiana* **5** (1898): 198-200. **Tellini.**
Sui mutamenti avvenuti nel corso dei fiumi Isonzo e Natisone e sull' antico nesso esistente tra i medesimi del Prof. A. Tellini.

On the changes in the course of the Isonzo river since Pliocene times.

Austria—Lakes. *Riv. G. Italiana* **5** (1898): 216-217. **Gavazzi.**
Area e profondità di alcuni laghi Carsici. Communicazione preliminare del Prof. Dott. Arturo Gavazzi.

A table of the altitude, area, and maximum depth of thirty-six lakes of the Karst region in Austria.

Balkan Peninsula. *M. k.k. Militär-G. I.* 17, 1897 (1898): 80–86. **Haardt.**
Begleitworte zu den Blättern der Generalkarte 1 : 200,000, welche die Balkan-Halbinsel betreffen. Von Vincenz Haardt von Hartenthurn. *With Map.*

Balkan Peninsula. *M. k.k. Militär-G. I.* 17, 1897 (1898): 161–192. **Truck.**
Die russische Triangulierung auf der Balkanhalbinsel in den Jahren 1877–1879. Nach officiellen Quellen bearbeitet von Sigismund Truck. *With Map.*

Bohemian Forest. *Leopoldina* 33 (1897): 136–140. **Wagner.**
Ueber Schneeverhältnisse im bayrisch-böhmischen Grenzgebirge. Von Dr. Paul Wagner.

On the snow-conditions of the mountains on the frontier of Bavaria and Bohemia.

Denmark. **Boyle.**
Trade and Agriculture of Denmark for the year 1897. Foreign Office, Annual No. 2141, 1898. Size 10 × 6½, pp. 28. *Plan. Price 3½d.*

Europe. *Scottish G. Mag.* 14 (1898): 281–294, 346–357. **Geikie.**
The Tundras and Steppes of Prehistoric Europe. By Professor James Geikie, D.C.L., etc. *With Map.*

Europe—Inland Navigation. **Penck and Leibbrand.**
Ueber die einheitliche Pflege der Hydrographie der Verbandsländer. 2 Heft. Vorträge von Professor Dr. Penck und Präsident Leibbrand. (Deutsch-Oesterreichisch-Ungarischer Verband für Binnenschifffahrt, Verbands-Schriften. No. xix.) Berlin: Siemenroth & Troschel, 1897. Size 9½ × 6½, pp. 24. *Presented by the Authors.*

On the importance of the study of the hydrography of the inland waterways of Austria-Hungary and Germany.

Faroes. *Blackwood's Mag.* 164 (1898): 244–260. ——
The Faroes.

On the origin, character, and daily life of the people of Faroe.

France. *Mém. S. Spéléologie* 3 (13) (1898): 1–54. **Décombaz.**
Les Grottes de la Vallée de la Bourne et du Vercors. Par M. Décombaz. *With Plans and Illustrations.*

France. *C. Rd.* 126 (1898): 1890–1891. **Delebecque.**
Sur les lacs de la Roche de Rame (Hautes-Alpes), du Lauzet (Basses-Alpes), de la Roquebrussanne et de Tourves (Var). Note de M. André Delebecque.

France. **Demolins.**
Edmond Demolins. Les Français d'aujourd'hui, Les types sociaux du Midi et du Centre. Paris: Firmin-Didot et Cie. [1898]. Pp. xii. and 466. *Maps and Plans.*

A special notice of this book is given.

France. *Tour du Monde* 4 (1898): 301–312. **Martel.**
Dans les cavernes des Causses (dixième campagne souterraine, 1897). Par M. E. A. Martel. *With Illustrations.*

France—Anjou. *La G.* 11 (1898): 187–188, 196–197. **Chevigné.**
Géographie historique and descriptive de la Vallée d'Anjou. Par Aug. de Chevigné.

France—Brittany. **Rainaud.**
La "Bretagne" de Rütimeyer. Analyse critique. Par A. Rainaud. Rennes: Plihon et Hervé, 1898. Size 10 × 6½, pp. 28.

France—Saint-Émilion. *B.S.G. Com. Bordeaux* 21 (1898): 241–249. **Saint-Laurent.**
Note sur Saint-Émilion. Par A. de Saint-Laurent.

Concise notes on the town and commune of St. Emilion, with reference to its wine industry, and historical memoranda.

Germany. *Globus* 74 (1898): 21–24. **Kohlenberg.**
Das Schwimmende Land von Waakhausen. Von A. Kohlenberg.

On the boggy moorland near Waakhausen.

Germany. *Globus* 74 (1898): 13–15. **Krause.**
Der ehemalige Thorner See. Von Dr. med. Ernst H. L. Krause. *With Map.*

Germany. *Notizb. V. Erdk. Darmstadt* 18 (1897): 4–13. **Nell.**
Resultate der im Grossherzogthum Hessen für die Zwecke der Internationalen Erdmessung ausgeführten Präcisions-Nivellements. Von Dr. A. Nell.

Germany—Brandenburg. *Naturw. Wochenschrift* **13** (1898): 313–315. **Zache.**
Tektonische Thäler und Erosionsthäler in der Mark. Von Eduard Zache. *With Sketch-Map.*

A contribution to the study of the morphology of the North German plain.

Germany—Frankfort. **Oppenheimer.**
Trade of Frankfort and District for the year 1897. Foreign Office, Annual No. 2122, 1898. Size 10 × 6, pp. 58. *Price 3d.*

Germany—Harz Mountains. *Terrestrial Magnetism* **3** (1898): 77–82. **Putnam.**
Results of Professor Eschenhagen's Magnetic Investigations in the Harz Mountains. By G. R. Putnam.

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Die schleswigschen Halligen und das Leben auf denselben. Von P. Andresen.

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Germany—Schleswig-Holstein. *Globus* (1898): 359–361. **Hansen.**
Neue Köge in Süderdithmarsch. Von Dr. R. Hansen-Oldesloe. *Map.*

On the coast reclamations on the North Sea.

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Topologie et toponymie antiques. Mégare. Par M. V. Bérard. *With Map.*

Holland. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **15** (1898): 149–153. **Kuyper.**
De Dichtheid der Bevolking in Nederland. Door J. Kuyper. *With Map.*

On the density of population in Holland.

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Th. Thoroddsen, Geschichte der Isländischen Geographie. Vorstellungen von Island und seiner Natur und Untersuchungen darüber in alter und neuer Zeit. Autorisierte Uebersetzung von August Gebhardt. Zweiter Band: Die Isländische Geographie vom Beginne des 17. bis zur Mitte des 18 Jahrhunderts. Leipzig: B. G. Teubner, 1898. Size 10 × 7, pp. xvi. and 384.

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Per la navigazione fluviale fra Venezia e il bacino del Po, di Primo Lanzoni.

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Florence, its Administration and Institutions. Foreign Office, No. 463, Miscellaneous, 1898. Size 10 × 6, pp. 48. *Price 2½d.*

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Trade of Sicily for the year 1897. Foreign Office, Annual No. 2120, 1898. Size 10 × 6½, pp. 48. *Price 2½d.*

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Determinazioni della gravità relativa fatte nelle regioni Etne e nella Sicilia orientale. Nota del A. Riccò.

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The Lagoons of Venice. By Giacomo Boni. *With Map and Illustrations.*

An appeal for the improvement of Venice by dredging the channels and promoting the tidal scour of sea-water through the lagoons.

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La comparsa di fiamme nel cratere vesuviano. Nota del prof. R. V. Matteucci.

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Notes of a Journey in Southern Spain and Tangier in 1895. By J. C. Blake. *With Map and Illustrations.*

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Gli Albanesi nel Montenegro. Comunicazione del socio dott. A. Baldacci.

Montenegro. **Kennedy.**
Trade of Montenegro for the year 1897. Foreign Office, Annual No. 2114, 1898. Size 9½ × 6½, pp. 6. *Price* ½*d.*

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Report for the year 1897 on the Trade and Commerce of Norway. Foreign Office Reports, Annual No. 2119. London: Eyre & Spottiswoode, 1898. Size 10 × 6, pp. 58. *Price* 3*d.*

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Russia—Ural. *M.G. Ges. Hamburg* 14 (1898): 1–23. **Friederichsen.**
Der südliche und mittlere Ural. Von Max Friederichsen. *With Plates.*

A description of the Ural excursion following the Geological Congress in Russia in 1897.

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Trade of Warsaw and District for the Year 1897. Foreign Office, Annual No. 2135, 1898. Size 10 × 6½, pp. 42. *Price* 3*d.*

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Die Hirten und Hirtennomaden Süd- und Südostserbiens. Von M. Smiljanić. I.

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Några anmärkningar om den Centraljämtska issjön. Af Gunnar Andersson. (Aftryck ur Geol. Fören. i Stockholm Förhandl. Bd. 19. Häft 6, 1897.) Size 8½ × 5½, pp. [6].

Sweden—Lake Hjälmar. *Ymer* 18 (1898): 155–164. **Nerman.**
Hjälmarens vattenförhållanden åren 1889–1897. Af Gustaf Nerman.

Tables of the average water-level in terms of a gauge, the rainfall in millimetres, the resulting volume of water added in cubic metres, and the outflow for each month for nine years.

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Les populations du Valais. Par M. Eugène Pitard.

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Describes a journey through Albania in 1897.

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Customs Tariffs of the United Kingdom, from 1800 to 1897. With some Notes upon the history of the more important branches of receipt from the year 1660. London: Eyre & Spottiswoode, 1897. Size 13½ × 8½, pp. 908 and xxxvi. *Price* 7*s.* 6*d.*

This bulky report may be looked upon as in large measure a history of the Protective system as applied in the United Kingdom.

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On the Interglacial Submergence of Great Britain. By Henr. Munthe. *With Map and Sections.*

The evidence of the fauna of the interglacial clays in Kintyre and Inverness as to the submergence of Great Britain is here discussed.

United Kingdom—England. *J. Manchester G.S.* 13, 1897 (1898): 159–164. ——
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Account of a right-of-way in Derbyshire, with a map and well-selected photographs illustrating the character of the district.

ASIA.

Arabia. **Bent.**
Exploration in the Yafei and Fadhli Countries. By Mrs. Theodore Bent. (From the *Geographical Journal* for July, 1898.) Size 10 × 6½, pp. 24. *Map and Illustrations.*

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Une Excursion à l'Oasis de la Hadg ou El Hota près d'Aden. Par M. Désiré Charnay. *With Illustrations.*

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Excursions au Yémen. Par Désiré Charnay et A. Deflers. *With Map and Illustrations.*

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Les explorations en Asie en 1897. Par M. Hulot. *With Map.*

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The Crown Colonies in Asia in 1898. By G. R. Badenoch, LL.D.

Caspian Sea—Pilot. **Pushchin.**
Caspian Sea Pilot. Hydrographical description and guide for Navigation. Compiled by Captain N. Pushchin. Publication of Chief Hydrographic Department. [In Russian.] St. Petersburg, 1897. Size 9½ × 6½, pp. viii. and 346. *Charts.*

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Central Asia—Historical. **Berlioux.**
Les premiers Voyages des Européens dans l'Asie Centrale et au Pays des Sères la Chine du Nord. Par le Professeur E. F. Berlioux. Extrait du *Bulletin* de la Société de Géographie de Lyon de Juillet, 1898. Lyon, 1898. Size 10 × 6½, pp. 82. *Map.*

Central Asia—Turkestan. *Iz. Imp. Russ. G.S.* 33, 1897 (1898): 403-410. **Masalsky.**
The Santorine Industry in Turkestan. By K. V. I. Masalsky. [In Russian.]

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Interim Report on the Operations of the Archæological Survey at Sigiriya, 1897. By H. C. P. Bell. *With Plans and Illustrations.*

Ceylon. *J. Ceylon Br. R. Asiatic S.* 15 (1898): 23-37. **Modder.**
Ancient Cities and Temples in the Kurunégala District: Dambadeṇiya. By F. H. Modder.

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A Geological and Mineralogical Sketch of the North-Western Province, Ceylon. By F. H. Modder.

China. *Blackwood's Mag.* 164 (1898): 132–145. ——
Pioneers of Commerce.

On the recent British commercial missions to China.

China. ——
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China. *Imp. and Asiatic Quarterly Rev.* **6** (1898): 62–68. **Barton.**

The Yang-tsze Valley and British Commerce. By Alfred Barton, M.D.

China. **Bourne.**

Report on the Trade of Central and Southern China. Foreign Office, Miscellaneous, No. 458. London: Eyre & Spottiswoode, 1898. Size 10 × 6½, pp. 100. *Maps and Section. Price* 1s. 5½*d.*

Permission was given to Mr. Bourne in August, 1896, to take charge of a commercial mission promoted by the Blackburn Chamber of Commerce, and he now reports on the information which he has collected. The report deals with the trade and the conditions of commercial life generally in Shanghai, Chingkiang, Hankow, and Ichang, and in the provinces of Ssu-ch'uan, Yünnan, Kuei-chow, Kwang-si, and finally in Canton and Hongkong.

China. *Imp. and Asiatic Quarterly Rev.* **6** (1898): 35-61. **Colquhoun.**

The Railway Connection of India and China. By Archibald R. Colquhoun.

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The Railway Connection of India and China. By Archibald R. Colquhoun.

The paper deals mainly with the resources of Southern China and the existing means of communication.

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Le chemin de fer de Pékin.

China. **Mayers.**

Report on a Journey from Peking to Shanghai Overland. Foreign Office, Miscellaneous, No. 466. London: Eyre & Spottiswoode, 1898. Size 10 × 6, pp. 16. *Price* 1*d.*

A full account of the route from Peking to Shanghai *viâ* Honan, with notes on native routes.

China. *Imp. and Asiatic Quarterly Rev.* **6** (1898): 152–173. **Parker.**

Burma's supposed "Tribute" to China. By E. H. Parker.

China—Hainan. *B.S.G. Com. Paris* **20** (1898): 361–370. **Madrolle.**

L'île d'Hai-Nan. Par M. Cl. Madrolle.

China—Shantung. **Richthofen**

Schantung und seine Eingangspforte Kiautschou. Von Ferdinand Freiherr von Richthofen. Berlin: D. Reimer (Ernst Vohsen), 1898. Size 10 × 7, pp. xxviii. and 324. *Maps and Plates (and Maps in separate cover). Presented by the Publisher.*

This timely publication of fuller extracts from Baron von Richthofen's letters and journals than were published in his great scientific work on China will be more fully noticed.

China—Tea Production. *Oester. Monats. Orient* **24** (1898): 65–72. ——

Chinas Theeproduction und Thee-Export. (Special bericht des k. und k. General-Consulates in Shanghai.)

China—Wei Hai Wei. *Fortnightly Rev.* **64** (1898): 36–43. **Yorke.**

Wei Hai Wei, our latest leasehold possession. Being recollections of Wei Hai Wei, with suggestions for a definite policy in the Far East. By R. S. Yorke.

Chinese Empire—Tibet. *J. Asiatic S. Bengal* **67** (Pt. i.) (1898): 126–129. **Das.**

A Note on the Identity of the great Tsang-po of Tibet with the Dihong. By Sarat Chandra Das.

A block of wood engraved with a Tibetan inscription picked up in the Brahmaputra in 1896, is brought forward as confirmation of the identity of that river with the Tsanpo.

Chinese Empire—Tibet. *Questions Dipl. et Colon.* **4** (1898): 291–295, 353–362. **Roux.**

La politique Chinoise au Thibet. Par Émile Roux.

An account of the part played by China in Tibet.

Eastern Asia. *J. Asiatique* **11** (1898): 210–238. **Courant.**

Stèle chinoise du royaume de Ko kou rye. Par M. Maurice Courant.

Eastern Asia. **Schlegel.**

Geographical Notes. I. The Nicobar and Andaman Islands. II. Lang-ga-siu or Lang-ga-su and Sih-lan Shan, Ceylan. By G. Schlegel. Reprinted from the *T'oung-Pao*, vol. ix. No. 3. Leyden: E. J. Brill, 1898. Size 10 × 6½, pp. 24.

French Indo-China. *C. Rd. S.G. Paris* (1898): 229–232. **Amelot.**
La navigabilité du Mékong aux basses eaux entre Kratié et Stung-treng. Par G. Amelot.

French Indo-China. *Rev. Scientifique* **9** (1898): 785–787. **d'Enjoy.**
L'autonomie communale en Annam. Par M. Paul d'Enjoy.

French Indo-China. **Lefèvre.**
Un Voyage au Laos. Par le Dr. E. Lefèvre. Paris: E. Plon, Nourrit et Cie., 1898. Size 7½ × 5, pp. 304. *Map and Illustrations.*

The author was a member of the Pavie mission in 1894–95, which determined the boundary in co-operation with a British Commission.

India. ——
Imperial Institute. Indian Section. Annual Report for the year 1897–98. London: Eyre & Spottiswoode, 1898. Size 13½ × 8½, pp. 98. *Map and Diagrams.*

These reports deal chiefly with the chemical analysis of some Indian products.

India. *M.G. Ges. Hamburg* **14** (1898): 1–268. **Hübbe-Schleiden.**
Indien und die Indier, kulturell, wirthschaftlich und politisch betrachtet. Von Hübbe-Schleiden, Dr. jur.

The author spent two years in India, and in this interesting treatise he endeavours to correct the mistaken views prevalent in Germany as to Indian affairs. He deals in much detail with Hindu and Mohammedan life and customs, and has chapters on Indian civilization, commercial development, the British political system, and the future of India.

India. *B.S. d'Études Colon.* **5** (1898): 85–110. **Leval.**
Les Indes Anglaises et leur influence sur la grandeur de l'Angleterre. Par M. Gaston de Leval.

India. **Moos.**
Magnetical and Meteorological Observations made at the Government Observatory, Bombay, 1896, under the direction of N. A. F. Moos, with an appendix. Bombay, 1897. Size 14 × 10, pp. [88]. *Diagrams.*

India. *P.I. Civil Engineers* **132** (1898): 130–272. **Strange.**
Reservoirs with high earthen dams in Western India. By W. L. Strange. *With Plate.*

India—Andaman Islands. *Indian Antiquary* **27** (1898): 26–27. **Temple.**
Some technical terms and names in Port Blair. By R. C. Temple.

Curious results of corruptions of European names due to native mispronunciation, and subsequent phonetic transcription.

India—Assam. ——
Report on the Administration of the Province of Assam for the year 1896–97. Shillong, 1898. Size 13½ × 8½, pp. xiv., 210, and ccxvi. *Map. Presented by the India Office.*

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Progress Report of Forest Administration in the Province of Assam for the year 1896–97. (From July 1, 1896, to June 30, 1897.) By A. L. Home. Calcutta, 1897. Size 13½ × 8½, pp. 98 and 6. *Map.*

India—Assam. **Monahan.**
Annual Report of the Department of Land Records and Agriculture, Assam, for 1896–97. By F. J. Monahan. Calcutta, 1897. Size 13½ × 8½, pp. 50. *Map.*

India—Burma. **Macquoid.**
Report on various sites for a Sanitarium in Burma. By Lieut. C. E. Macquoid. Rangoon, 1897. Size 13½ × 8½, pp. [20]. *Maps. Presented by the Quarter-Master-General in India.*

India—Chittagong. *J. Asiatic S. Bengal* **67** (Pt. 1) (1898): 20–28. **Das.**
A Note on the Antiquity of Chittagong, compiled from the Tibetan works Pagsam Jon-Zan of Sumpa Khau-po and Kāhbab Dun-dan of Lama Tārā Nātha. By Sarat Chandra Das.

India—Industry. *J.S. Arts* **46** (1898): 679–685. **Wood.**
Effect of the Cotton Spinning Industry in China upon the kindred Industry in India. By Walter C. Wood.

India—Madras. ——
Report on the Administration of the Madras Presidency, during the year 1896-97. Madras, 1897. Size 13½ × 8½, pp. xvi., 40, 214, and ccx. *Maps and Diagrams.*

India—Mica Mining. *J.S. Arts* **46** (1898): 671–673. **Thompson.**
Mica Mining in the District of Nellore, India. By Robert W. Thompson.

The mining of mica has lately been greatly extended.

India—North-West Provinces and Oudh. ——
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India—Railways. **Gracey.**
Administration Report on the Railways in India for 1896-97. By Colonel T. Gracey. London: Eyre & Spottiswoode, 1897. Size 13 × 8½, pp. xiv., 220, and lxx. *Map and Diagram. Price* 3*s.* 4*d.*

Japan—Mining. *Oester. Monats. Orient* **24** (1898): 37–44. ——
Die Montanindustrie Japans.

Korea. **Willis.**
Report on a Consular Journey to Ping-yang and Chenampo. London: Eyre & Spottiswoode. Foreign Office, Miscellaneous, No. 433, 1897. Size 9½ × 6, pp. 16. *Price* 1½*d.*

Malay Archipelago—Amboina. **Wichmann.**
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Der Wawani auf Amboina und seine angeblichen Ausbrüche. Von Arthur Wichmann. II.

Malay Archipelago—Java. **Davids.**
Trade of Java for the year 1897. Foreign Office, Annual No. 2095, 1898. Size 10 × 6, pp. 18. *Price* 1½*d.*

Malay Archipelago—Java. *Naturw. Wochenschrift* **13** (1898): 297-304. **Fürst.**
Kaffee-, Zucker-, Tabak- und Thee-Cultur auf Java. Von Dr. E. Fürst.

Malay Archipelago—Sumatra. *Rev. G.* **42** (1898): 379-384, 456–462. **Harrasowski.**
Au pays des cannibales (voyage de M. le baron de Brenner). Par Mme. de Harrasowsky.

Malay Peninsula—Flora. *J. Asiatic S. Bengal* **66** (2) (1897): 1–345. **King.**
Materials for a Flora of the Malayan Peninsula. By George King, LL.D., etc.

Malay Peninsula—Perak. **Wray, Stephens, and Derry.**
Perak Museum Notes. Vol. ii. Part ii. On Rubber and Ramie Cultivation in Perak, and Chapter V. of Tin Mining in Perak, by L. Wray, jun. Together with papers on Ficus Elastica and Tapping of Para trees at Kuala Kangsar, by A. B. Stephens and R. Derry. And a Report on the Perak Museum. Taiping, 1898. Size 10 × 6½, pp. 77–138. *Diagrams.*

Philippine Islands. *Contemporary Rev.* **74** (1898): 20–33. **Foreman.**
Spain and the Philippine Islands. By John Foreman.

Philippine Islands. *Fortnightly Rev.* **64** (1898): 72–87. **Garnett.**
The Philippine Islands. By Lucy M. J. Garnett.

Philippine Islands. *National G. Mag.* **9** (1898): 257–284. **Hilder.**
The Philippine Islands. By F. F. Hilder. *With Map, Chart, and Illustrations.*

The *National Geographic Magazine* is taking excellent advantage of the interest in geography evoked by the Spanish-American war, and now follows up its admirable Cuban number with a number devoted exclusively to the Philippine Islands.

Philippine Islands. **Walker.**
Trade of Philippine Islands for the year 1897. Foreign Office, Annual No. 2133, 1898. Size 9½ × 6½, pp. 14. *Plan. Price* 5½*d.*

Philippine Islands. *National G. Mag.* **9** (1898): 284–301. **Worcester.**
Notes on some Primitive Philippine Tribes. By Dean C. Worcester. *With Illustrations.*

AFRICA.

Abyssinia. *Mouvement G.* **15** (1898): 290-291. **Darragon.**
Exploration de l'Abyssinie méridionale. Par L. Darragon.

Abyssinia. *Questions Dipl. et Colon.* **4** (1898): 222-229. **Genardière.**
Les Chemins de fer Français en Abyssinie. Par G. de la Genardière. *With Map.*

On the projected French railway from Jibuti to Harrar (now under construction) and thence westwards to Enlotto.

Abyssinia. *B.S.G. Italiana* **11** (1898): 352-358. **Roncagli.**
Viaggio del sig. Darragon dallo Scioa al paese dei Bòran e viceversa, nota del socio corrispondente G. Roncagli.

On a journey of a French traveller, M. Leon Darragon, from Addis Abeba to the Boras country in the summer of 1897.

Africa—Exploration. *G.Z.* **4** (1898): 336-349. **Schenck.**
Die Afrikaforschung seit dem Jahre 1884 und ihr gegenwärtiger Stand. Von Dr. Adolf Schenck.

Africa—Leo's Work. **Schefer.**
Recueil de Voyages et de Documents pour servir à l'Histoire de la Géographie depuis le XIII^e^ jusqu'à la fin du XVI^e^ siècle. [Vols. xiii. and xiv.] Description de l'Afrique tierce partie du Monde escrite par Jean Leon African. Premièrement en langue Arabesque, puis en Toscane et à présent mise en François. Nouvelle Édition annotée par Ch. Schefer. [Vols. i. and ii.] Paris: E. Leroux, 1896-97. Size 11 × 7½, pp. (vol. i.) lii. and 378; (vol. ii.) viii. and 490. *Maps.*

An annotated reprint of Temporal's French translation of Leo Africanus' great 'Description of Africa.'

African Anthropolgy. *Z. Ges. Erdk. Berlin* **33** (1898): 111-125. **Frobenius.**
Der Ursprung der afrikanischen Kulturen. Von L. Frobenius. *With Maps.*

Africa—Railways. *A travers le Monde, Tour du Monde* **4** (1898): 237-238. ——
Les Chemins de fer en Afrique. *With Map.*

Algeria—Sahara. *A travers le Monde, Tour du Monde* **4** (1898): 201-204. **Blanchet.**
Les Villes mortes du Sahara. Par M. P. Blanchet. *With Illustrations.*

On the ruins found in the desert beyond Biskra.

British West Africa. *Fortnightly Rev.* **64** (1898): 216-230. **Bourne.**
Sierra Leone Troubles. By H. R. Fox Bourne.

British West Africa—Ashanti. *Kew B.* (1898): 65-82. ——
Botany of Ashanti Expedition.

British West Africa—Niger. *Globus* **74** (1898): 6-9. **Seidel.**
Aus der Fetischstadt Issele am unteren Niger. Von H. Seidel. *With Illustration.*

Cape Colony. *Imp. and Asiatic Quarterly Rev.* **6** (1898): 84-90. **Seton.**
The Position of Cape Colony in South African Affairs. By Malcolm Seton.

Cape Colony—Kimberley. *T.S. African Philosoph. S.* **9** (1898): 54-67. **Sutton.**
An Inquiry into the Origin of the Mud Rushes in the De Beer's Mine, Kimberley, 1894-1896. By J. R. Sutton, B.A.

Cape Verd Islands. *B.S.G. Italiana* **11** (1898): 358-368. **Fea.**
Dalle Isole del Capo Verde, lettera del socio corrispondente Leonardo Fea. *With Illustrations.*

Central Africa. ——
1897. Report of the Universities' Mission to Central Africa. London: Published at the Office of the Mission. Size 7½ × 5½, pp. 118. *Portraits.*

Central Africa. *Oester. Monats. Orient.* **24** (1898): 44-47. **Schöller.**
Die Expedition Dr. Schöller's nach Centralafrika.

Central Africa. *Export* **20** (1898): 331-332, 340-342. **Schöller.**
Die Expedition Dr. Schöller's nach Centralafrika.

Congo State. *Globus* **73** (1898): 366-372. **Glave.**
Glaves Reise von Nyangwe nach Matadi. Grausamkeiten im Kongostaat. *With Illustrations.*

Congo State. **Pickersgill.**
Report on the Congo Independent State. Foreign Office, No. 459, Miscellaneous, 1898. Size 10 × 6½, pp. 14. *Price* 1*d.*

Congo State. *Rev. Scientifique* **10** (1898): 33–39. **Thys.**
Le Chemin de fer de Matadi au Stanley-Pool et les travaux publics au Congo. Par M. A. Thys.

East Africa. *Verh. Ges. Erdk. Berlin* **25** (1898): 251–262. **Schoeller.**
Herr Dr. Max Schoeller: Einige wissenschaftliche Ergebnisse seiner Expedition nach Äquatorial-Ost-Afrika und Uganda 1896–1897.

Egypt. ———
All about Postal Matters in Egypt. Florence: The Landi Press, 1898. Size 8¼ × 6, pp. 24.

This anonymous pamphlet gives lists of the post-offices of Egypt, and examples of Egyptian names for places and people.

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Beiträge zur Topographie und Geo-chemie des Aegyptischen Natron-Thals. Von G. Schweinfurth und L. Lewin. *With Map.*

Egypt—Thebes. *J.R.I. Brit. Architects* **5** (1898): 421–435. **Hippolyte-Boussac.**
Thèbes: Excursion à la Vallée-des-Reines. Par P. Hippolyte-Boussac. With Illustrations by the Author, and English translation.

Eritrea. *Globus* **72** (1897): 362–366. **Bruchhausen.**
Die alten und neuen Grenzen Erythräas. Von Carl v. Bruchhausen. *With Map.*

French Congo. *C. Rd. S.G. Paris* (1898): 241–244. **Herr.**
La rivière Ouom. Par Dr. Herr. *With Sketch-maps.*

Controverting M. Wauters's identification of the river Wom, discovered by Clozel in 1894, with the Ombela, a tributary of the Ubangi.

French Congo—Cape Lopez. *Ann. Hydrographiques* (1897): 54–58. **Blim.**
Détermination de la position géographique du phare du cap Lopez. Par M. E. Blim.

The position of Cape Lopez has been redetermined by M. Blim, who finds it to be 0° 37′ 43″ S. and 6° 18′ 0″ E. of Paris, in place of 0° 36′ 25″ S. and 6° 22′ 55″ E., as formerly given.

French Sudan. *B.S.G. Lyon* **15** (1898): 111–126. **Ducret.**
Notes sur l'exploitation commerciale de la région du Nioro du Soudan Français. Par M. P. Ducret.

French Sudan. *A travers le Monde, Tour du Monde* **4** (1898): 169–172, 185–188. **Noll.**
La France au Soudan, de 1863 à 1898. Par M. Ned Noll. *With Map and Illustrations.*

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Reconnaissances dans la région des lacs de Tombouctou. Par P. Vuillot.

French West Africa—Ivory Coast. *B.S.G. Lyon* **15** (1898): 82–110. **Westphal.**
La Côte d'Ivoire, son avenir Industriel et Commercial. Par M. Westphal.

German East Africa. *M. Deutsch. Schutzgeb.* **11** (1898): 172–173. **Sprigade.**
Begleitworte zu der Karte der Reisen des Bergassessors W. Bornhardt im Nordwesten des Nyassa-Sees. Von P. Sprigade. *With Map.*

German West Africa—Togo. *Globus* **73** (1898): 340–344, 355–359. **Seidel.**
System der Fetischverbote in Togo. Ein Beiträg zur Volkskunde der Evhe. Von H. Seidel.

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Alaska. *J. School G.* **2** (1898): 206–215. **Semple.**
Indians of South-eastern Alaska in relation to their Environment. By Ellen C. Semple.

British Columbia and Alaska. **Kettle.**
A Supplement to the Third Edition of Findlay's Sailing Directory for the North Pacific Ocean, Chapters V. to IX., being the coasts and islands of British Columbia

and Alaska, from the Strait of Juan de Fuca to Behring Strait. By W. R. Kettle. London: R. H. Laurie, 1898. Size 10 × 6½, pp. iv. and 56. *Presented by the Publisher.*

Canada—British Columbia. *P.I. Civil Engineers* **132** (1898): 1–46. **Stanton.**
The Great Land-Slides on the Canadian Pacific Railway in British Columbia. By R. B. Stanton. *With Maps.*

Canada—Geological Survey. ———
Summary Report of the Geological Survey Department for the year 1897. Ottawa, 1898. Size 10 × 7, pp. 156. *Plan.*

Canada—Yukon District. *Scottish G. Mag.* **14** (1898): 337–346. **Ogilvie.**
The Yukon District. By Wm. Ogilvie. *With Map and Illustrations.*

Canada—Yukon District. *Rev. G.* **42** (1898): 278–283, 345–355, 434–438. **Tricoche.**
Les mines d'or du Klondyke. Par G. N. Tricoche. *With Maps.*

Mexico. **Lumholtz and Hrdlička.**
Marked Human Bones from a Prehistoric Tarasco Indian Burial Place in the State of Michoacan, Mexico. By Carl Lumholtz and Aleš Hrdlička. Authors' Edition, extracted from *Bulletin* of the American Museum of Natural History, vol. x., article v., pp. 61–79. New York, March 31, 1898. Size 10 × 6½. *Plates. Presented by Carl Lumholtz.*

Mexico—Vera Cruz. **Chapman.**
Trade of Vera Cruz for the year 1897. Foreign Office, Annual No. 2134, 1898. Size 10 × 6, pp. 26. *Price 2d.*

United States. *P. Boston S. Nat. Hist.* **28** (1898): 157–235. **Bangs.**
The Land Mammals of Peninsular Florida and the Coast Region of Georgia. By Outram Bangs. *With Illustrations and Map.*

United States. *National G. Mag.* **9** (1898): 308-317. **Gilbert.**
Origin of the Physical Features of the United States. By G. K. Gilbert. *With Maps.*

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Geographic Work of the General Government. By Henry Gannett.

United States—Arizona. *M. G. Ges. Hamburg* **14** (1898): 1–28. **Fernow.**
Die Wälder und Wüsten von Arizona. Von B. E. Fernow, PH.D., etc.

United States—District of Columbia. *National G. Mag.* **9** (1898): 317–323. **McGee.**
Geographic Development of the District of Columbia. By W. J. McGee.

An interesting account of the origin and development of the Federal capital of the United States.

United States—Georgia. *J. Franklin I.* **146** (1898): 19–26. **Tatham.**
Gold Mining in Georgia. By Wm. Tatham.

United States—Massachusetts. **Perry.**
The Physical Geography of Worcester, Massachusetts. By Joseph H. Perry. With illustrations by J. Chauncey Lyford. Published by the Worcester Natural History Society, Worcester, Mass., 1898. Size 9½ × 6, pp. 40. *Presented by the Author.*

An excellent piece of regional geography, illustrated by a series of highly characteristic photographs.

United States—Osage Indians. *Globus* **73** (1898): 349–355. **Gatschet.**
Die Osageindianer. Von Albert S. Gatschet. *With Illustrations.*

United States—Pacific Coast. **Holden.**
Smithsonian Miscellaneous Collections. 1087. A Catalogue of Earthquakes on the Pacific Coast, 1769 to 1897. By Edward S. Holden, LL.D. Washington: Published by the Smithsonian Institution, 1898. Size 10 × 6, pp. 254. *Maps. Presented by the Smithsonian Institution.*

The introductory matter describes the methods of seismological observations carried on at the Lick Observatory. The catalogue gives particulars of all recorded shocks on the Pacific coast.

Cuba. *Nineteenth Century* **44** (1898): 196–207. **Pérez.**
The Spaniards in Cuba. By Antonio Gonzalo Pérez.

Cuba. *Rev. Française* **23** (1898): 417–429. **Vasco.**
L'Insurrection Cubaine. Par G. Vasco. *With Map.*

Cuba—Santiago. *Rev. Française* **23** (1898): 359–363. **Lassalle.**
Santiago de Cuba. Par C. de Lassalle. *With Map.*

The map is a very rough sketch.

Cuba. *Contemporary Rev.* **74** (1898): 1–19. **Musgrave.**
The Cuban Insurrection. By G. C. Musgrave.

Cuba. *Quarterly Rev.* **188** (1898): 216–241. ———
The United States and Spain.

A summary of the events leading to the war between Spain and the United States.

French Guiana. *Rev. Scientifique* **10** (1898): 7–15. **Levat.**
Les placers aurifères du Contesté franco-brésilien. Par M. E. D. Levat.

The article gives a history of the dispute as to the boundary between French Guiana and Brazil, points out that the region in dispute is richly auriferous, and urges that a railway should be constructed to supply ready access.

Guatemala. **Trayner.**
Trade of Guatemala for the year 1897. Foreign Office, Annual No. 2139, 1898. Size 10 × 6½, pp. 48. *Price* 2½*d.*

Jamaica. **Roxburgh and Ford.**
The Handbook of Jamaica for 1898 . . . comprising Historical, Statistical, and General Information concerning the Island. Eighteenth Year of Publication. Compiled . . . by T. L. Roxburgh and Jos. C. Ford. London: E. Stanford, 1898. Size 9 × 6, pp. viii., 560, and x. *Map. Presented by the Publisher.*

Jamaica. *T. Canadian I.* **5** (1898): 325–357. **Spencer.**
Late formations and great Changes of Level in Jamaica. By J. W. Spencer. *With Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australasie. *Deutsche Rundschau G.* **20** (1898): 450–457. **Greffrath.**
Fortschritte der geographischen Forschungen und Reisen im Jahre, 1897. I. Australien und die Südsee. Von Henry Greffrath.

Australia. **McCormick.**
Trip to the Land of the Kangaroo. By Rev. W. T. McCormick. Size 6 × 8. *Presented by the Author.*

A personal record of an ordinary trip to Australia.

Australia. **Petherick.**
Australia in 1897. The Country and its Resources, Population, Public Works, and Finances. With Remarks on the Manufacture of Wool in the Colonies, Emigration, Federation, the Funding of Australian Public Debts, etc. Second Edition. By Edward A. Petherick. London: Effingham Wilson, 1897. Size 9½ × 6, pp. 56. *Maps. Presented by the Author.*

Australia—Year-Book. ———
The Year-Book of Australia for 1898. Seventeenth Year of Publication. London: Paul & Co. Size 9 × 6, pp. 760. *Maps. Price* **10*s.* 6*d.*** *Presented by the Agent-General for New South Wales.*

British New Guinea. ———
Annual Report on British New Guinea from 1st July, 1896, to 30th June, 1897. With Appendices. Brisbane, 1898. Size 13½ × 8½, pp. xxvi. and 96. *Maps and Illustrations. Presented by the Colonial Office.*

British New Guinea. *B.S.G. Italiana* **11** (1898): 385–399. **Giulianetti.**
Nella Nuova Guinea Britannica. Lettera di Amedeo Giulianetti al presidente della Società, march. G. Doria. *With Map and Illustrations.*

The author, on this journey, explored part of the Wharton range.

British New Guinea. ———
British New Guinea. Correspondence relating to an Agreement between the Government of British New Guinea and the British New Guinea Syndicate. London: Eyre and Spottiswoode, 1898. Size 13½ × 8½, pp. viii. and 34. *Price* 4½*d.*

Fiji. **Vaughan.**

Fiji. Meteorological Observations taken at Suva during 1897. By J. D. W. Vaughan. Suva: E. J. March, 1898. Size 13½ × 8½, pp. 16.

Kerguelen. *Questions Dipl. et Colon.* 4 (1898): 205–213. **Thirion.**

Kerguelen Station navale et lieu de déportation. Par Paul Thirion. *With Map.*

Notes on Kerguelen in connection with a proposal recently made to establish a French penal settlement in that island.

POLAR REGIONS.

Antarctic Drift Ice. *Ann. Hydrographie* 26 (1898): 219–226. ———

Treibeis in höheren südlichen Breiten.

Arctic. *J. City of London College Sci. S.* 5 (1898): 29–50. **Koettlitz.**

Three Years in the Arctic. By J. Reginald Kœttlitz.

A concise account of the Jackson-Harmsworth expedition.

Arctic Ocean. *Iz. Imp. Russ. G.S.* 33, 1897 (1898): 369–402. **Wrangell and Makaroff.**

Researches in the Northern Arctic Ocean. Reports of Baron F. F. Wrangell, and Vice-Admiral S. O. Makaroff. *With Map and Diagrams.* [In Russian.]

Arctic—Sannikoff Island. *Globus* 73 (1898): 365–366. **Pech.**

Sannikow-Land im Sibirischen Eismeere und der Plan einer Expedition dahin. Von T. Pech.

The plan of Baron Toll's expedition was given in detail in the *Journal* for August.

Greenland. *Ymer* 18 (1898): 141–154. **Flink.**

En mineralogisk resa i Grönland 1897. Af Gust. Flink. *With Map.*

Mineralogical observations in the Julianehaab district.

Spitsbergen. *Ymer* 18 (1898): 127–140. **Meisenbach.**

En färd till Sjuöarne Sommaren 1897. Af G. Meisenbach. *With Map and Illustrations.*

A visit to the Seven Isles in the north of Spitsbergen in the summer of 1897.

MATHEMATICAL GEOGRAPHY.

Azimuth Tables. *Ann. Hydrographie* 26 (1898): 211–218. **Meldau.**

Ueber Azimuttafeln. Von Dr. Heinrich Meldau.

Barometric Heights. **Cordeiro.**

The Barometrical Determination of Heights. A Practical Method of Barometrical Levelling and Hypsometry for Surveyors and Mountain Climbers. By F. J. B. Cordeiro. London: E. & F. N. Spon, 1898. Size 7 × 5, pp. 28. *Presented by the Publishers.*

Cartography. *M. k.k. Militär-G. I.* 17, 1897 (1898): 203–226. **Hödlmoser.**

Ueber Terrain-Darstellung in Karten. Von Carl Hödlmoser. *With Maps.*

Cartography. *M. k.k. Militär-G. I.* 17, 1897 (1898): 193–202. **Hübl.**

Beiträge zur Technik der Kartenerzeugung. Von Arthur Freiherrn von Hübl. II. Der Kartendruck. *With Maps.*

Cartography. *M. k.k. Militär-G. I.* 17, 1897 (1898): 53–68. **Steeb.**

Die geographischen Namen in den Militär-Karten. Von Christian Ritter von Steeb. *With Maps.*

Geodesy—Gravity. *M. k.k. Militär-G. I.* 17, 1897 (1898): 100–160. **Sterneck.**

Relative Schwerebestimmungen, ausgeführt in den Jahren 1895 und 1896. Von Robert von Sterneck. *With Maps.*

Godesy. **Weiss and Schram.**

Publicationen für die Internationale Erdmessung. Astronomische Arbeiten des k. k. Gradmessungs-Bureau, ausgeführt unter der Leitung des Hofrathes Theodor V. Oppolzer. Nach dessen Tode herausgegeben von Prof. Dr. Edmund Weiss und Dr. Robert Schram. IX. Band. Längenbestimmungen. Wien: F. Tempsky, 1897. Size 12½ × 10, pp. 228.

The determination of the difference in longitude between Greenwich, Munich, and Vienna.

Geographical Instruments. *Scottish G. Mag.* 14 (1898): 357–363. ——
From Astrolabe to Quadrant.

A sketch of the evolution of the quadrant through the cross-staff.

Height-Measurement. *M. k.k. Militär-G. I.* 17, 1897 (1898): 87–99. **Rummer.**
Die Höhenmessungen bei der Militär-Mappierung. Von Adolf Rummer von Rummershof. *With Map.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Coast Features. *J. School G.* 2 (1898): 215–227. **Curtis.**
A Model of Seashore Characteristics. By G. C. Curtis. *With Illustrations.*

Desert Scenery. *Naturw. Wochenschrift* 13 (1898): 237–241. **Walther.**
Ueber die Formen der asiatischen Wüste. Von Johannes Walther.

An abstract of part of Prof. Walther's work on the phenomena of desert erosion.

Forests. *J. Franklin I.* 146 (1898): 1–19. **Gifford.**
Forestry in Relation to Physical Geography and Engineering. By John Gifford. *With Illustrations.*

Geomorphology. *Mem. S.G. Italiana* 7 (1898): 267–304; 8 (1898): 3–51. **Porena.**
Della Morfologia della superficie terrestre nella geografia e dei tipi di rilievo colla loro nomenclatura in italiano. Memoria del prof. F. Porena.

A critical study of the classification and terminology of land-forms, with constant reference to the work of Richthofen, Penck, De Lapparent, and Wagner.

Geophysics. *J. City of London College Sci. S.* 5 (1898): 1–17. **Lobley.**
Presidential Address: The Crust of the Globe and its Disturbances. By Prof. J. Logan Lobley. *With Illustration and Diagram.*

Also separate copy. *Presented by the Author.*

A study of the crust of the Earth, the author believing that all surface movements are the results of physical and chemical changes in the superficial layer of crust, all below 10 miles in depth being altogether apart, not affecting the crust, and unaffected by it.

Land Forms. *T. Canadian I.* 5 (1898): 359–368. **Spencer.**
Resemblances between the Declivities of High Plateau and those of Submarine Antillean Valleys. By J. W. Spencer. *With Map.*

Meteorology. *Ann. Hydrographie* 26 (1898): 203–209. ——
Reisen der Schiffe "Nereus," Kapt. J. Schulte, und "Pestalozzi," Kapt. B. Petersen, von Lizard nach Valparaiso. *With Charts.*

The nearly simultaneous voyages of these vessels have enabled a series of synoptic isobaric charts to be drawn.

Meteorology— **Woeikof.**
Einige Resultate der fünfjährigen Beobachtungen auf dem Eiffelthurme. Von A. Woeikof. From *Meteorologische Zeitschrift*, Oktober 1897. Size 11½ × 8, pp. 353–359.

Meteorology—Clouds. ——
No. 112. [U.S.] Hydrographic Office. Illustrative Cloud Forms for the Guidance of Observers in the Classification of Clouds. [Washington, D.C., 1897.] Size 5½ × 10. *Presented by the U.S. Hydrographic Office.*

A series of very beautiful cloud pictures reproduced in colour. The only adverse criticism that might suggest itself, is that the artistic treatment of the foregrounds sometimes detracts from the effect of the cloud forms. If all the foregrounds had been the same, it would have been better from the meteorological point of view.

Meteorology—Clouds. *Meteorolog. Z.* 15 (1898): 216–225. **Erk.**
Ueber die Einwirkung von Flussläufen auf eine darüber befindliche Wolkendecke. Von Dr. F. Erk.

The author notes the curious phenomena observed by him on balloon ascents, that a layer of cloud lying over an irregular country presents on its upper surface depressions corresponding to the course of the valleys it conceals.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology—Homanen. **Schwerdtfeger.**
Die Heimath der Homanen (Indogermanen). IV. Von Schwerdtfeger. Cruttinnen, 1898. Size 9 × 6, pp. 36. *Presented by the Author.*

Commercial Geography—Coal. *Nineteenth Century* 44 (1898): 151-168. **Taylor.**
The Coal Supplies of the World. By Benjamin Taylor.

Commercial Geography—Cotton. *Ann. G.* 7 (1898): 289-307. **Lederlin and Gallois.**
La culture du coton dans le monde. Par MM. A. Lederlin et L. Gallois. *With Map and Diagram.*

Commercial Geography—Gold. **Suess.**
Mem. and P. Manchester Lit. and Philosoph. S. **42**, No. 10 (1898): 1-9.
The New Gold Discoveries. By Eduard Suess.

Prof. Suess recalls and confirms the dictum of the Greek philosophers that gold is only found on the utmost frontiers of civilization. With the increasing output of gold, and the diminishing area beyond the frontiers of civilization, Prof. Suess sees an early prospect of exhaustion of supply; and a very serious danger in the extension of gold standards for currency in countries now using silver.

Historical. **Fresne-Canaye.**
Recueil de Voyages et de Documents pour servir à l'Histoire de la Géographie depuis le XIII^{e} jusqu'à la fin du XVI^{e} siècle. XVI. Le Voyage du Levant de Philippe du Fresne-Canaye (1573). Publié et annoté par M. H. Hauser. Paris: E. Leroux, 1897. Size 11½ × 7½, pp. xxxviii. and 332. *Portraits, Map, and Plates.*

Historical—Etna. **Sudhaus.**
Sammlung wissenschaftlicher Commentare zu Griechischen und Römischen Schriftstellern. Aetna. Erklärt von Siegfried Sudhaus. Leipzig: B. G. Teubner, 1898. Size 10 × 7, pp. x. and 230.

A new edition of the text of an anonymous latin poem on Mount Etna, with German translation, and an explanatory commentary on the detailed descriptions of the volcanic phenomena of the mountain which it contains. The commentator believes that these descriptions are founded on Posidonius.

Historical—Hannibal's Journeys. *Riv. G. Italiana* 5 (1898): 299-305. **Grasso.**
Sui limiti dell' Insula allobrogica. Nota di Gabriele Grasso.

Discussion as to the meaning of the word *Insula* as applied to the dwelling-place of the Allobrogians encountered by Hannibal after crossing the Alps.

Historical—Maps. *B.S.G. Com. Bordeaux* 21 (1898): 225-230. **Duffart.**
Carte de Masse (1707-1724). Par Ch. Duffart.

On the discovery of two unpublished sheets of a map of part of the landes.

BIOGRAPHY.

Biographical Dictionary. **Lee.**
Dictionary of National Biography. Edited by Sydney Lee. Vol. liii. Smith—Stanger; vol. liv. Stanhope—Stovin; vol. lv. Stow—Taylor. London: Smith, Elder, & Co., 1898. Size 10 × 7, pp. (vol. liii.) vi. and 486; (vol. liv.) vi. and 446; (vol. lv.) vi. and 486. *Price (each vol.)* 15*s.*

Vol. liii. includes notices of the following names of geographical interest: John Smith, by J. A. Doyle; Admiral William Henry Smyth, by Prof. J. K. Laughton; William Parker Snow, by the same; Sir George Somers, by Sidney Lee; Mary Somerville, by Miss Clerke; John Hanning Speke, by William Carr; Vice-Admiral T. A. B. Spratt, by Prof. J. K. Laughton; Richard Spruce, by G. S. Boulger; and William Grant Stairs, by Colonel R. H. Vetch, C.B. Vol. liv.—Bishop Edward Steere, by C. A. Harris; Henry Aaron Stern, by the Rev. W. G. D. Fletcher; W. B. Stevenson, by E. Irving Carlyle; and John Lort Stokes, by Prof. J. K. Laughton. Vol. lv.—Sir Paul Edmund de Strzelecki, by T. Seccombe; John McDouall Stuart, by C. A. Harris; Charles Sturt, by Mrs. Napier Sturt; and Sir Bartholomew James Sulivan, by Prof. J. K. Laughton.

Hænke. **Ballivian and Kramer**
Tadeo Hænke escritos precedidos de algunos apuntes para su Biografia y acompañados de varios documentos ilustrativos. Por M. V. Ballivian y Pedro Kramer. La Paz: 1898. Size 8½ × 6, pp. xxxviii. and 114. *Presented by the Author.*

Biography of the Bohemian traveller Thaddeus Hænke, born 1761, who travelled largely in South America, and died in 1817, followed by an account of his travels and writings.

Michelet. *Rev. G.* **42** (1898): 451-455. **Corcelle.**
Michelet géographe, à propos de son centenaire (Juin 1898). Par J. Corcelle.

Mueller. *P.R.S.* **63** (1898): xxxii.-xxxvi. **[Hooker.]**
Baron Ferdinand von Mueller. By J. D. H.

Ortelius. *Deutsche Rundschau G.* **20** (1898): 467–472. **Wolkenhauer.**
Abraham Ortelius. Von Dr. W. Wolkenhauer. *With Portrait.*

Sievers. *Deutsche Rundschau G.* **20** (1898): 424–425. ———
Dr. G. J. Sievers. *With Portrait.*

Dr. Sievers, born 1843, died 1898, was for a time associated with Dr. Radde in the exploration of the Caucasus.

Sohncke. *Deutsche Rundschau G.* **20** (1898): 472–473. ———
Leonhard Sohncke. *With Portrait.*

Prof. Sohncke was born in 1842, died in 1897. He was a physicist, much interested in questions of meteorology and physical geography.

Steeb. *Deutsche Rundschau G.* **20** (1898): 421–424. ———
Feldmarschall-Lieutenant Christian R. v. Steeb. *With Portrait.*

The subject of this memoir was Director of the Military and Geodetic Institute in Vienna.

Vasco da Gama. *Rev. G. Italiana* **5** (1898): 259-276. **Toni.**
Vasco di Gama. Per M. G. Toni.

Vischer. *M. k.k. G. Ges. Wien* **41** (1898): 380–393. **Altinger.**
Des österreichischen Geographen Georg Matthaeus Vischer letztes Lebensjahr. Von Dr. P. Altmann Altinger. *With Plates.*

Vischer died in 1696, and various obscure passages in his life are now cleared up by the discovery of documents.

GENERAL.

Ballooning. *C. Rd.* **127** (1898): 135-138. **Bort.**
Résultats des ascensions des trois ballons-sondes lancés à Trappes le 8 juin. Note de M. L. Teisserenc de Bort.

Educational. **Redway and Hinman.**
The Natural Geographies. Natural Advanced Geography. By Jacques W. Redway and Russell Hinman. New York: American Book Co. [1898]. Size 12¼ × 10¼, pp. 160. *Maps and Illustrations. Presented by J. W. Redway, Esq.*

A note will be given on this work.

Geographical Progress. *G.Z.* **4** (1898): 305-320. **Hettner.**
Die Entwicklung der Geographie im 19 Jahrhundert. Von Alfred Hettner.

Prof. Hettner's Inaugural Address on being appointed to the new Chair of Geography in the University Tübingen.

Hamburg Geographical Society. *M.G. Ges. Hamburg* **14** (1898): 1–43. **Friederichsen.**
Rückblick auf die Gründung und Entwickelung der Geographischen Gesellschaft in Hamburg während der ersten fünfundzwanzig Jahre ihres Bestehens. Von L. Friederichsen.

A history of the Hamburg Geographical Society, which was founded in 1873.

Oriental Art. ———
The Collection of Oriental Objects of Art of Sir Rutherford Alcock, K.C.B. Size 10 × 6½, pp. 72.

Place-names. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 75–79. **Bielawski.**
Die Schreibung geographischer Namen nach russischen Kartenwerken. Von Josef Bielawski.

Place-names. *M. k.k. Militär-G. I.* **17**, 1897 (1898): 67–74. **Levačić.**
Die Schreibung der geographischen Namen auf der Balkan-Halbinsel. Nach einer Studie des K. u. K. Hauptmannes Johann Levačić.

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England and Wales. **Bartholomew.**

New Reduced Ordnance Survey of England and Wales. Scale 1 : 126.720 or 2 stat. miles to an inch. Sheet 34, Dorset. J. Bartholomew & Co., Edinburgh, 1898. *Price 2s., mounted on cloth. Presented by the Publishers.*

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme 1897. Sheets: 296, Frankfurt; 346, Grünberg. Scale 1 : 100,000 or 1·7 stat. miles to an inch. *Price 1.50 marks each sheet.*

Historical Atlas. **Poole.**

Historical Atlas of Modern Europe, from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World, connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of Magdalen College and Lecturer in Diplomatic in the University of Oxford. Part xix. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston, 1898. *Price* 3*s.* 6*d.* each part. *Presented by the Clarendon Press.*

This part contains: Map 36, Germany in the Later Middle Ages (1273–1492), by the Editor; Map 73, The Eastern Roman Empire (1025–1472), by Prof. Bury, LITT. D.; Map 87, European Colonies and Dependencies, 1763, by Hugh E. Egerton, M.A. Each of these maps is accompanied by explanatory letterpress.

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Liverpool. **Bartholomew.**

Plan of Liverpool. Scale 1 : 12,672 or 300 yards to an inch. By J. Bartholomew, F.R.G.S. Published by W. H. Smith & Sons, London, 1898. *Price* 2*s.* *Presented by Messrs. J. Bartholomew & Co.*

Russia. **Langhans.**

Die deutschen Mennoniten-Kolonien in Süd-Russland. Scale 1 : 500,000 or 7·9 stat. miles to an inch. Von Paul Langhans. *Petermanns Geographische Mitteilungen,* Jahrgang 1898, Tafel 12. Gotha: Justus Perthes. *Presented by the Publisher.*

ASIA.

Asia Minor. **Diest.**

Karte der wichtigsten Nachbargebiete der anatolischen Eisenbahn-Linien. Nach eigenen Aufnahmen in den Jahren 1886, 1892 u. 1896 sowien ach unveröffentlichten Skizzen des Dr. Alfred Korte u. sonstigen neuen Beiträgen auf Prof. Heinrich Keiperts Grundlage neu zusammengestellt von Walther von Diest. Scale 1 : 250,000 or 4 stat. miles to an inch. *Petermanns Geographische Mitteilungen,* Jahrgang 1898, Ergänzungsheft, No. 125, Tafels 1, 2, and 3. Gotha: Justus Perthes, 1898. *Presented by the Publisher.*

AFRICA.

Congo State. **Du Fief.**

Carte de l'État Indépendant du Congo, dressée d'après les itineraires originaux des voyageurs. Par J. du Fief, Secrétaire-général de la Société royal belge de géographie. Scale 1 : 2,000,000 or 31 6 stat. miles to an inch. 4 sheets. *Presented by the Author.*

This is the third edition of du Fief's map of the Congo Free State. It has been corrected where necessary to bring it up to date, and contains two additional insets, showing the termini of the railway at Matadi on the Congo, and Dolo on Stanley Pool. The routes of all the principal travellers are shown in red, and the dates of their explorations are given.

AMERICA.

United States. **U.S. Geological Survey.**

Geologic Atlas of the United States. Scale 1 : 125,000 or 2 stat. miles to an inch. Folios: Gadsden (Alabama); Downieville (California); Pueblo (Colorado); Nevada City (California); Morristown (Tennessee); Briceville (Tennessee); Buckhannon (West Virginia); Piedmont (West Virginia—Maryland); Franklin (West Virginia—Virginia); Pocahontas (Virginia—West Virginia); Yellowstone National Park (Wyoming). Department of the Interior, United States Geological Survey; C. D. Walcott, Director. Washington, D.C. *Presented by the U.S. Geological Survey.*

These folios are accompanied by full descriptive letterpress, sections, and illustrations. The maps are given, first showing the topographical features, and then geologically coloured.

Venezuela. **Sievers.**

Originalkarte der Caños im Oriente von Venezuela. Nach eigenen Reisen und Richard Ludwigs Aufnahmen gezeichnet von W. Sievers. Scale 1 : 425,000 or 6·7 stat. miles to an inch. *Petermanns Geographische Mitteilungen,* Jahrgang 1898, Tafel 10. Gotha: Justus Perthes, 1898. *Presented by the Publisher.*

AUSTRALIA.

Brisbane. **Pugh.**

Map of Brisbane and Suburbs. Published by Gordon and Gotch, Brisbane, with Pugh's Almanac, 1898.

Queensland. **Pugh.**

Map of Queensland. Compiled and lithographed from official maps. Scale 1 : 2,977,920 or 47 stat. miles to an inch. Published by Gordon & Gotch, Brisbane, with Pugh's Almanac, 1898.

GENERAL.

Flag Diagram. **Brown.**

Royal Victorian Edition : Flags of Britain and her Colonies ; also the Standards and Flags of all Nations. James Brown & Son, Glasgow, 1898. *Price* 1*s*. *Presented by the Publishers.*

Meteorological. **Supan.**

Verteilung der mittleren jährlichen Regenmenge auf der Erdoberfläche. Von Alexander Supan. Equatorial Scale 1 : 100,000,000 or 1578 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 13. Gotha : Justus Perthes. *Presented by the Publisher.*

Terrestrial Magnetism. **Schmidt.**

Linien gleicher Werte der rechtwinkeligen Komponenten der erdmagnetischen Kraft zur Epoche 1895. Von Dr. Adolf Schmidt. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 11. Gotha : Justus Perthes, 1898. *Presented by the Publisher.*

World. **Andree.**

Andrees allgemeiner Handatlas, 126 Haupt- und 130 Nebenkarten auf 186 Kartenseiten, nebst alphabetischem Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Bielefeld und Leipzig : Verlag von Velhagen & Klasing, 1898.—Lief 24, Nord- und Mittelbayern ; Frankreich, Uebersicht.—Lief 25, Kaukasusländer ; Palastina ; Britisch Nordamerika.—Lief 26, Provinz Schlesien ; Vorderindien, Südlicher Teil ; Burma und Malayische Halbinsel.—Lief 27, Hessen—Nassau, Grossherzogtum Hessen und Fürstentum Waldeck ; Frankreich, Nördliche Hälfte ; Nördlicher und Südlicher Sternhimmel. Das Sonnensystem. Mondkarte ; Thüringische Staaten.—Lief 29, Nordamerika ; Neuguinea und der Bismarckarchipel, Die Sudseeinseln.

World. **Bartholomew.**

The Citizen's Atlas. One hundred maps and gazetteer. By J. G. Bartholomew, F.R.G.S. Published by George Newnes, Ltd., London. To be completed in 20 parts, issued fortnightly. Parts 12, 13, and 14. *Price* 6*d*. *each*.

CHARTS.

United States Charts. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic and North Pacific Oceans for August and September, 1898. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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The

Geographical Journal.

No. 5. NOVEMBER, 1898. Vol. XII.

OCEANOGRAPHY OF THE NORTH ATLANTIC.*

By ALBERT PRINCE OF MONACO.

The study of the ocean, to which the title of Oceanography is given, occupies a considerable field in science, which, in spite of the interest it offers from many points of view, has been little cultivated until quite recent times. This omission need not provoke surprise, for mankind has only quite lately taken an interest in scientific knowledge, and had long remained the slave of prejudice and childish legend. What soil so favourable for the weaving of legend as the sea, till now immeasurable and unfathomable, inhabited by beings scarcely perceived, more alive than the forests on land, when tempests heap its waters wave upon wave, when it vibrates under the shocks of nature?

A ray of truth was needed before the gates of free inquiry could be opened, and men could face without shrinking all the uncertainty which guides their fates. It was necessary that human nature should be moulded by the spirit of science before it could overcome the tendency to see its own type in all the problems of the universe.

It came as a revelation, when, in 1818, John Ross found an *Asteria* in Baffin's bay at a depth of 984 fathoms; and again, in 1860, when the soundings taken for the first Transatlantic cable between Ireland and Newfoundland brought up *Asteria* and *Serpulæ* from depths of 670 and 1240 fathoms; or, in 1863, when the Americans used a trawl successfully on their coasts down to a depth of 1400 fathoms; or, in 1865, when Alphonse Milne-Edwards recognized the presence of polypes on a piece of Trans-Mediterranean cable taken up from a depth of 1100 fathoms; and, finally, when from 1867 onwards special expeditions like those of

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* Paper read at the Royal Geographical Society, April 25, 1898.

Wyville-Thomson and Carpenter on the *Lightning* made collections in the deep seas to the north of Great Britain and off the west coast of Europe.

These efforts of intelligent pioneers marked the first triumph of free investigation over preconceived ideas, and science formally took possession of a region wider than the continents, wherein are mountains and valleys, warm and cold streams, light and oxygen, and everywhere abundant life.

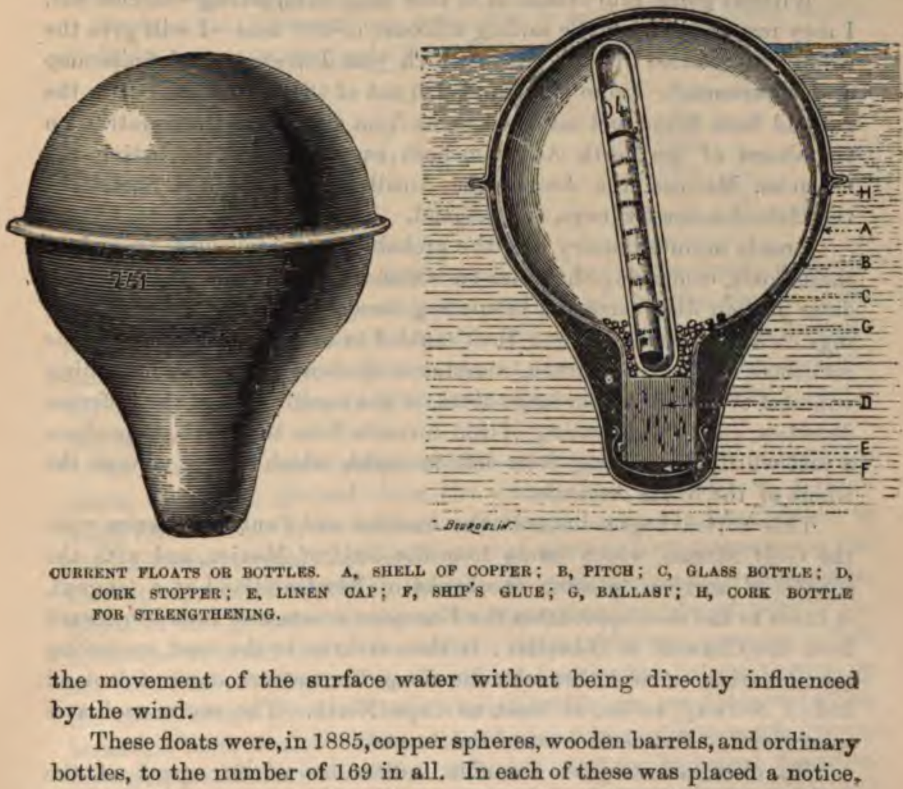
Next came the *Challenger*, which made a wonderful voyage round the world under the command of Nares and Thomson, with a picked scientific staff of such men as Murray, Moseley, Buchanan, and the others. The *Challenger* brought home many unknown and unfamiliar creatures from every sea, and wealth of observations concerning their strange conditions of life.

The example of all this devotion to scientific research gave me (a pupil of Spanish sailors) the ambition to contribute my share—and I would make it as large a share as possible—to the advancement of oceanography, of a science well fitted to seduce the imagination by the bond which it forms between poetry, philosophy, and pure science. For fifteen years I have given to it all the time and all the resources I have been able to spare from the duties of my life, and I shall continue to give them while strength remains. Coming after these expeditions, which had interrogated the sea somewhat feverishly, as one does in order to obtain the avowal of an important secret, I have thought it time to analyze in its details the problem already solved in its broader aspects. I chose the *massif* of the Azores as the first centre of closer investigation; this centre seemed the most suitable for my purpose, as it lies almost in mid-Atlantic, far from the influences of the mainland, and the great depths of the surrounding seas guarantee its purely oceanic character.

I set about my work in the summer of 1885, with no other apparatus than the *Hirondelle*, a little sailing schooner of 200 tons. From 1885 to 1889 I made some long cruises in the *Hirondelle*, which took me as far as the American coasts, and I explored depths as great as 1600 fathoms without help of any power greater than the arms of my fourteen sailors. My apprenticeship as an oceanographer being thus served, I secured the aid of such skilled colleagues as Dr. Richard, and later on, the *Hirondelle* being worn out by storms, I built a stronger steam-vessel, the *Princess Alice*, 560 tons, to carry on the same research with better appliances. The work of this second period has opened up to me fields of labour altogether beyond my reach without the aid of a still larger and more powerful vessel, so I have commissioned Messrs. Laird of Birkenhead to build me another *Princess Alice*, of 1400 tons, which will doubtless set out on her first voyage in a few weeks.

CURRENTS.—Before studying the creatures exiled in the depths of the sea, it was necessary to complete the study of those conditions of their life dependent on the statics and dynamics of the medium in which they live. To that end I wished, first of all, to establish the laws governing the surface currents of the North Atlantic, which play an important part in the distribution of heat and cold, of moisture and salinity, over the sea, and in the range and evolution of animal species.

Partly alone, partly in collaboration with Prof. Pouchet, I undertook an experiment on a large scale by means of floats. During the three years 1885, 1886, 1887 I launched on the surface of the North Atlantic three series of floats, so constructed and weighted as to follow the movement of the surface water without being directly influenced by the wind.



CURRENT FLOATS OR BOTTLES. A, SHELL OF COPPER; B, PITCH; C, GLASS BOTTLE; D, CORK STOPPER; E, LINEN CAP; F, SHIP'S GLUE; G, BALLAST; H, CORK BOTTLE FOR STRENGTHENING.

These floats were, in 1885, copper spheres, wooden barrels, and ordinary bottles, to the number of 169 in all. In each of these was placed a notice, in several languages, enclosed in a sealed glass tube, asking the finders, whatever their nationality, to return this notice with a record of the place and date of finding. The floats were weighted—the spheres with a bag of sand, the barrels with an iron pig attached by an iron wire, and the bottles with the sealed tube containing the notice. The weights of the first two were supposed to become detached by the rotting of the bag or the rusting of the wire, so as roughly to compensate for the increase of weight caused by calcareous and organic accretions on the body of the float, and through which the latter could have sunk. In

1886, well-corked glass bottles were employed to the number of 510; and in the following year 931 strong glass floats with copper coverings were cast adrift.

The first series was launched over a distance of 170 miles to the north-west of the Western Azores; the second series over a distance of 500 miles along the 20th meridian west of Paris, and between the latitudes of the north of Spain and the south of England. The third series extended over 710 miles, of which 600 miles were right across the Gulf Stream between the Western Azores and the banks of Newfoundland.

Without going into details as to this long undertaking—carried out, I may repeat, with a little sailing schooner of 200 tons—I will give the results it produced up to 1892, in which year I drew up a definite map of the currents.* Up to that time, 226 out of the 1675 floats put in the sea had been found and returned to me from almost all the countries on the shores of the North Atlantic, both east and west, including the Canaries, Madeira, the Azores, the Antilles, Bermuda, the Shetlands, the Hebrides, the Orkneys, and Iceland.

I made minute inquiry into the probable course followed by each of these floats, comparing the dates on which they were launched with the dates of their discovery, and tabulating the dates of the successive findings on all the coasts; I was thus enabled to establish the fact that the influences of the Gulf Stream combine with those of certain prevailing winds, of evaporation over large areas, of the equilibrium of the different densities, and of the meeting of cold currents from the north, to produce a vast whirlpool rotating from left to right, which sweeps almost the whole of the North Atlantic.

This vortex begins towards the Antilles and Central America with the Gulf Stream, which issues from the Gulf of Mexico, and with the equatorial current; passing the banks of Newfoundland at a tangent, it turns to the east, approaches the European coasts, and runs southward from the Channel to Gibraltar; it then returns to the west, encircling the Canaries. A wide branch runs along the western coast of Ireland and of Norway, as far, at least, as Cape North. The centre oscillates somewhere to the south-west of the Azores.

My observations gave valuable indications of the speed of the different sections of this vortex. A comparison of the times taken by batches of floats of the same point of origin to reach their various stopping-places enabled me to establish the following average rates for the twenty-four hours:—

Between the Azores, France, Portugal, and the Canaries ...	5·18 miles.
From the Canaries to the Antilles, the Bahamas, and as far as the Bermudas	10·11 „
From the Bermudas to the Azores	6·42 „

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* See *Proc. R.G.S.*, vol. xiv., p. 620.

The mean speed for the North Atlantic is 4·48 miles; but all these values are under rather than over the truth, since in most cases the floats were probably not found till some time after their arrival.

Depth and Pressure.—After the movements of the surface water of the ocean (that of the lower layers rapidly diminishing to, no doubt, nearly *nil* in the depths), the depth of the sea and the resultant pressure must be ascertained. The work of oceanographers during the last thirty years has taught us all we know of these matters, and it has dispelled the illusions which had filled the imagination of seamen and particularly of Magellan, the great navigator of the sixteenth century, who, having made in the Pacific the first sounding beyond 200 fathoms, declared it the deepest spot in the ocean.

To-day Otto Krümmel has been able to estimate the mean depths of all the seas, excepting only the polar region, as follows:—

Atlantic ocean	2012	fathoms.
Indian ocean	1828	„
Pacific ocean	2125	„
Antarctic ocean	1804	„
Arctic ocean	844	„
Mediterranean sea	732	„

The work done since Krümmel's calculations has not seriously modified these values. The greatest depth was found in the Pacific, 4688 fathoms, off the east coast of Japan.[*] Soundings in the North Atlantic have not yet exceeded 3878 fathoms, to the north of St. Thomas; but the latest explorations for projected cables may have slightly raised this figure.

To obtain accurate measurements of depths, a number of arrangements have been devised, from the simple lead plummet on a thick hemp line—which by its fantastic working allowed the imagination of the experimenters to discover depths of 6000 to 8000 fathoms—to the accurate apparatus which by the use of steel wire now gives measurements of the greatest depths to an approximation almost within the coefficient of elasticity of the metal. Since 1893 the progress which has been made in the construction of steel cables has led me to give up the use of single wires of this material, which are too liable to sudden breakage, in favour of a thin cable of nine wires, giving much greater strength, pliability, and safety, with but slightly increased diameter. I use for my soundings a machine that I invented in 1891, and which gives the best results. Its brake is automatic, and works through springs; the winding of the cable, the regulation of the speed when going up or down, its drying and greasing are all easily managed by one man.

Corresponding to these depths are pressures of which the atmospheric pressure at the surface gives but a feeble idea. Thus, whereas under normal barometric conditions we live under a pressure equivalent to 15 lbs. per square inch, which is diminished in an insignificant ratio at altitudes of even hundreds of feet, marine creatures are subjected to a pressure of about 15 lbs. for every 5½ fathoms of depth; and the tissues of deep-sea animals must have a special structure to enable their organs to be functional under such conditions.

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[*] A greater depth has been lately reported from the Pacific.

Temperature.—At different depths the temperature of the water changes more or less regularly according to laws which have not yet been fully ascertained. The following are the values which I have observed in the neighbourhood of the Azores and at some points in the very deep water off Portugal (the numbers are uncorrected):—

547	fathoms	50·0°	Fahr.
656	„	44·2°	„
820	„	42·4°	„
1093	„	39·0°	„
1312	„	38·5°	„
2406	„	36·9°	„
2898	„	38·7°	„
3007	„	38·5°	„

These numbers present differences in different regions. According to the calculations of Murray, based on the observations of the *Challenger*, the mean temperature of the North Atlantic is higher by 1·2° Fahr. than that of other oceans, and it is to the deeper waters that this excess is chiefly due.

In order to ascertain these temperatures, special instruments had to be devised, capable of registering the temperature of a certain spot and of bringing the record to the surface without modification by its passage through waters of intermediate temperatures. The Miller-Casella thermometer was the first to fulfil the necessary conditions, but as it was a maximum and minimum instrument it did not afford an accurate determination of the temperature at the precise depth to be examined. Later, Negretti and Zambra produced a better instrument for the purpose. I employ a slight modification of the Negretti and Zambra pattern, called the Chabaud thermometer, which acts as follows: The reservoir is cylindrical, and holds mercury; at a certain point it is constricted, forming an angle and ending in a small bulb; the tube is then continued. This thermometer is enclosed in a glass tube, strong enough to withstand high pressures, while its outer reservoir dips into a layer of mercury, itself contained in the reservoir of the outer tube: it is in this way protected from breakage and to some extent from the effects of pressure.

To ascertain the temperature of any medium, it is only necessary to invert the instrument. The column of mercury, which stands at a certain height in the thermometer, breaks off at a constricted point of the reservoir, and falls to the lower part of the tube, where it can undergo no further alteration. It only remains to read off the scale, which is inverted. The angle in the lower part was introduced by M. Chabaud to remove a defect in the Negretti and Zambra thermometers, which were liable to break the column inaccurately at the moment of inversion, a portion of the mercury from the reservoir sometimes following the column, and the subsequent impact against the bottom of the tube breaking the glass.

I invert the thermometer at the desired point by sending a "messenger" from the ship down the cable, which releases the armature by means of a lever; the thermometer, thus freed, swings over of itself. The messenger ought to reach the thermometer about ten minutes after it has been lowered to the point at which the observation is to be made, this being the time necessary for the mercury to acquire the temperature of its surroundings.

DENSITY.—The composition of sea-water is of considerable interest in connection with the study of life in the sea, for it governs the respiratory functions of marine animals. It varies in different parts much more than that of the air; the degrees of salinity of the different seas of the Earth present such variations that the distribution of the various animal species is largely dependent upon them.

All the simple bodies should be found in the sea, for it is constantly receiving the washings of the land; but the salt which gives it its special character is sodium chloride. The proportion of this salt varies according as the seas are open or closed, according to the distance from coasts where rivers pour their fresh waters into it, according to the varying amounts of evaporation in the different regions, according to the distance from the melting icebergs of the polar regions, and according to the depth.

I consider Buchanan's bottle the best instrument for collecting samples of water, with the dissolved gases, at different depths, especially since conclusive experiments made during my voyage of 1896 showed that in the depth of the sea the amount of dissolved gas is independent of the pressure, and that even if that amount is slightly greater than at the surface, this is entirely due to the greater solubility of gases at the lower temperatures.

Dr. Jules Richard, the chief of my laboratory on board, has invented a thoroughly trustworthy instrument for demonstrating this fact, which we investigated in the year mentioned at depths of 547 and 1476 fathoms. In the experiment, the neck of an inverted bottle filled with mercury dips into a dish, also full of mercury; in this position the bottle is sent to the required depth; the dish is then lowered, so that the mercury can run out of the bottle and the sea-water run in; then the bottle is lowered so that its neck again dips into the mercury. If gas is set free as the apparatus is drawn up, and accumulates over the mercury, it was obviously dissolved in greater quantity under the higher pressure; if, on the contrary, the bottle comes up full of water (as happened on the *Princess Alice*), the pressure does not increase the amount of gas in solution.

Sea-water contains four gases—oxygen, nitrogen, carbonic acid, and argon. The proportions in which these gases are present vary greatly with circumstances. The oxygen decreases and the carbonic acid increases with increasing depth—two facts first established by Carpenter, and known to have important relations to the abundance or scarcity of life in the various regions. After the researches made on my voyage of 1895, Dr. Richard was the first to announce the presence of argon in the swim-bladder of certain deep-sea fishes. We should expect that the deep layers of water would sooner or later become unfit to support respiration, especially in the absence of any restorative action by plants, which are rarely found below the 50-fathom line. Fortunately for the deep-sea fauna, however, the carbonic acid ascends by diffusion right up to the surface, while oxygen by the same means makes its way to the bottom. "It is," said Regnard, "a true respiratory process in the sea, assisted by the currents of the oceanic circulation." Thoulet showed that this diffusion of gases was brought about for inland seas where the current circulation is almost *nil*, as in the Mediterranean, by the fall of wind-borne dust on the sea, each grain of which, as it sinks, drags down with it adherent bubbles of air.

During the scientific expeditions of the Danish cruiser *Ingolf* in 1895 and 1896, M. Knudsen showed by analyses of samples of sea-water made immediately after collection, that the predominance of animal or vegetable life in any part causes the variations in the amount of contained oxygen or carbonic acid. Two bottles were filled with sea-water and corked, after the introduction into one of them of a large number of minute living crustaceans. Analysis of the gases three hours later showed that half the oxygen had been absorbed, while a slightly smaller amount of carbonic acid had been set free. Into the other bottle diatoms instead of crustaceans were introduced, and at the end of three hours, a quarter of the carbonic acid had been absorbed, while the quantity of oxygen was tripled.

LIGHT.—It is of great importance to the marine biologist that he should know to what point light exists in the depths of the sea. Unfortunately, the only instrument which can tell us is our own retina, and its powers are purely relative; it cannot be doubted that some marine animals have far more penetrating sight than others. Some there are, too, which can receive luminous perceptions by means other than eyes properly so called. Thus, *Actinia*, *Medusæ*, *Velella*, *Spongiaria*, etc., when subjected to light of greater or less intensity, give evidence of sensations to which the name of "dermatoscopic" is given. The imperfection of the images which it presents to its possessors must make this vision a strange one, but it doubtless corresponds to the intelligence it has to serve. Imagine the embarrassment of a holothurian or a medusa if suddenly provided with eyes as perfect and as seductive as those of some of my fair hearers!

Chemical experiments, such as the exposure of sensitive plates, have, indeed, been made to ascertain the depth to which the sun's light penetrates, but these are open to the objection that we do not know the precise limits of sensitiveness of the chemical substances employed. Further, it is possible that certain rays may penetrate sea-water which do not affect sensitized plates, just as red rays, which affect our retina, do not produce any impression on them. Be this as it may, Hermann Fol showed that the sun's rays ceased to act on the photographic plates he employed at a depth of 220 fathoms. I have here a graphic representation of the results of experiments I made to the south of Madeira with a photometrograph invented by my friend Dr. Regnard, which shows how rapidly light loses its intensity in penetrating below the surface.

On the other hand, it seems certain that, even if the light only penetrates to a comparatively short distance, many animals are able to store it up by means of special organs which serve them as lanterns, and to transport it, as it were, throughout the sea. Sometimes the number of minute animals emitting a phosphorescent glow is so great as to light up the water in which they live. In short, the question of light and vision in the depth of the sea is as yet but little understood; we can only assert that animals with well-developed eyes exist at all depths, and modern science teaches that an organ always atrophies or disappears when the conditions are such as to prevent its use.

Before showing you the animal life in the depths I must say something about the floor of the ocean itself, of the shifting materials on which is reared a column of water, sometimes as much as 4½ miles in height. You must think of the sea-bottom as of a great burying-place, where the bodies of countless creatures lie piled in the silence of their last long sleep. Do not protest against this excursion into the dominion of the mud which may at first seem barren and offensive. Here lie, sunk by the casualties of the sea, after their race is run in the light of the sun, great ships bearing wonders of our civilization and crowds of fortune-hunters, or of pleasure-seekers, collected from every corner of the earth. But this sea-mud, itself built out of death, will repel neither your senses nor your mind; it is not the horrible spectacle of decomposition we see around us, but one which rather recalls the old Christian motto, "Memento homo quia pulvis es, et quia in pulverem reverteris." As a matter of fact, organic decomposition does not appear, under the enormous pressures of the great depths, to present the same phenomenon as it does under atmospheric conditions.

The experiments in which Regnard, by means of special apparatus, artificially reproduced the phenomena of high pressures, showed that substances most liable to putrefaction, such as eggs and meat, resist decomposition for an indefinite time when subjected to pressures of hundreds of atmospheres, corresponding to depths of thousands of fathoms. It would be too much to conclude from this that the microscopic agents of putrefaction do not exist in the deep seas; but, in the absence of further knowledge, it must be admitted, firstly, that any microbes dragged down by sinking bodies from the surface are paralyzed or killed by the pressure; and secondly, that such bodies escape putrefaction for a long time, and form food for the inhabitants of those regions, who must eagerly avail themselves of such opportunities, since, in the absence of plant-life, they are all carnivorous.

It has not proved much easier to ascertain the composition of the sea-bottom than it did to take the temperature or to collect samples of water, and many devices have been tried for bringing up samples of the ooze and mud at the bottom. I do not know of any with all the advantages of the Buchanan sounder, which accompanies the water-bottle known by his name. It consists of a cylindrical punch, which brings up a long column of mud without interfering with the stratification; only pure sand and bare rock escape it, and, as these are scarcely found beyond quite insignificant depths, they are easily obtained with simpler instruments.

The following is a short *résumé* of the results obtained from examination of deep-sea deposits by such savants as Murray, Thoulet, Buchanan, Regnard, and Ehrenberg.

Though little is known as yet of the precise laws governing the formation of these deposits, the question is one of vast interest to geologists, for many of our land formations, rocky and otherwise, have had the same origin. The bottom of the sea is the universal storehouse of all the mineral detritus brought down from the land by the action of running water, winds, and volcanoes; it accordingly becomes the scene of slow chemical and physical processes, going on on a gigantic scale. The material of which it is composed varies according to the geological formation of the neighbouring land, according to the principal currents of the upper levels, according to the direction of the prevailing winds, and, above all, according to the depth. The deposits divide the sea-floor into several distinct zones, which merge insensibly one into another, and on the whole fall into two main categories—the terrigenous and the pelagic deposits. In the first the essential materials are derived from the disintegration of the land; they reach out into sea as far as the currents can take them before great depths are attained. The second class corresponds to the parts of the sea farthest from land, and the deposits consist almost exclusively of disintegrated mineral substances existing in the skeletons of pelagic animals, which are found in such numbers that some of them have given their names to characteristic deposits, such as the globigerina, pteropod, radiolarian, or diatom oozes.

The terrigenous deposits fall naturally into several zones:—

(1) The littoral zone, extending between the extreme tidal limits, in which rocks and other materials may be seen undergoing erosion under the direct action of the waves.

(2) The zone of Laminaria, in which the most luxuriant marine vegetation grows down to a depth of about 20 fathoms; the rock fragments are already much diminished in size, and form shingle, gravel, and sand.

(3) The coralline zone, extending to a depth of 50 fathoms, still fairly rich in plants, and perhaps the richest of all in animals. Already the depth of sand and mud is considerably greater.

(4) The deep zone, in which, at a depth of about 100 fathoms, those chemical actions begin which form muds of various kinds, arranged in layers or strata. There are, firstly, green muds, in which decomposition of organic matters occurs, and which still contain fragments of rock ranging from 0·20 inch to 0·79 inch in diameter. These extend to a depth of about 720 fathoms, and are succeeded by, secondly, the globigerina oozes, which go down to nearly 1950 fathoms. As the depth increases the proportion of lime becomes gradually less, and that of clay greater.

The globigerina are minute surface organisms, distributed over every sea; they form part of the group of Foraminifera, which includes three thousand known species of the simplest protozoan types in the animal kingdom. They possess a shell, which is transparent and provided with long spicules when the animal is alive, but resembles a lentil-seed riddled with holes after the inhabitant is dead. Down to a depth of 1950 fathoms the submarine deposits largely consist of shells of globigerina and similar calcareous *débris*; in greater depths it is supposed that chemical processes, in which the enormous pressure of the deep water plays a part, dissolve the calcareous substances before they reach the bottom.

The pelagic deposits consist of a series of muds in the abysmal depths, beginning with a red clay. The red clay often contains fine mineral grains—rarely more than 0·00039 inch in diameter—which are of volcanic origin, and are well described by Thoulet as "the ultimate stage in the modification of submerged matter under prolonged contact with sea-water."

The mineral substances found in marine deposits have their origin not only in the detritus brought by rivers and by the erosion of the coasts; they are also derived from volcanic and other dust spread over the surface of the sea by the wind.

Thus we learn how the humble pebble plucked from the shore passes slowly to the depths of mid-ocean; and how, first by the action of the waves, and later by chemical processes, it is broken up to form clay.

Again, the mass of organisms living and dying in the ocean supplement these deposits by the decomposition of their skeletons or their shells, which were themselves formed of materials derived from the land. Masses of rock are sometimes found in the lowest depths, and their presence is due either to icebergs which have carried them out to sea and dropped them, or to recent submarine disturbances of the Earth's crust.*

BIOLOGY.—You now know in its broad lines the physical and chemical conditions of the liquid masses of the ocean; I will attempt to give you an idea of its organic life, such as we have learned to know it in this medium after long and difficult researches which have not yet said their last word. Haeckel has made a useful division of the inhabitants of the sea into two classes: all those which move freely between the surface and the bottom he calls *plankton;* those which live on the bottom, whether actually fixed to it or not, he calls *benthos.* Hensen has attempted to gauge its mass, but our knowledge of the different levels does not yet seem to be sufficiently advanced to give complete results. So far from being uniform, the distribution of organisms is limited by conditions of density, temperature, light, and pressure. Even in mid-ocean the inhabitants of some levels alter their position at different times of the day, probably under the influence of the sun.

Much remains to be done before science can state the laws whereby the different species have become adapted to the ever-varying conditions. Because the animals of the *plankton,* from the whales to those of microscopic size, form species and genera of a number which it is not yet possible to determine: we discover some every year, either by inventing new instruments, or by exploring great depths more thoroughly.

First there is the trawl, varying in size according to the power of the ship. This consists of a large bag, provided with a guard to imprison all the animals which enter. Inside are hung some large swabs, while others are heaped on the bottom to protect fragile animals from damage caused by trawling, stones, lumps of mud, or the heavy carapaces of larger animals. Others, again, are hung outside, to entangle in their yarns such animals as sea-urchins, holothurians, sponges, crustaceans, etc., which are often found in them in a better state of preservation than inside the trawl. To manage the trawl, I have, on the *Princess Alice,* over 6000 fathoms of steel cable in a single length. The diameter of this cable is increased at every 2000 fathoms, in order that, in working at great depths, it may economize strength required to sustain its own weight. The breaking strain of the inner portion is 7 tons.

The trawl brings up the greatest number of individuals and of different species in every group, especially in those which, like the corallines, are fixed to the bottom; or in those which, like Echinodermata or Mollusca, can only move slowly, but it catches also a great number of fishes. I have used it down to a depth of 2944 fathoms. Amongst many interesting operations, I will mention here one of which I have retained a particularly vivid recollection. It was on the north coast of Spain, not far from the greatest depths of the Bay of Biscay; the trawl came up filled with crabs of the size of mice, armed with very sharp claws, of which they made a use which seemed exaggerated. They are called *Polybius Henslowi*, and the net had taken them in coming up, because they live in intermediate regions. By weighing a portion of this mass, we learned that there were 5000 individuals, although the net was torn in several places. They could run with great rapidity, and spread all over the yacht; for several days we found them in every hiding-place, even in our pockets and in our boots. Another experience served to confirm the belief that there are no roses without thorns. The trawl brought up, with a host of other treasures, a certain sea-urchin, the sight of which roused me to enthusiasm, for it was different from any species known to me. I at once laid hands on it, and received a prick from one of its spines. For several hours I suffered the most acute pain I have ever known; this was probably the first discovery of a poisonous stinging sea-urchin, and I shall not forget it.

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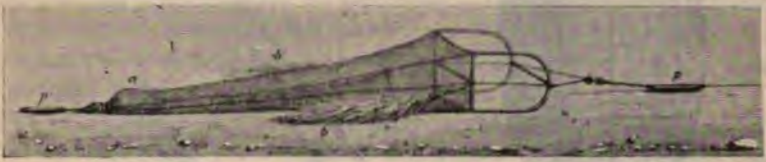
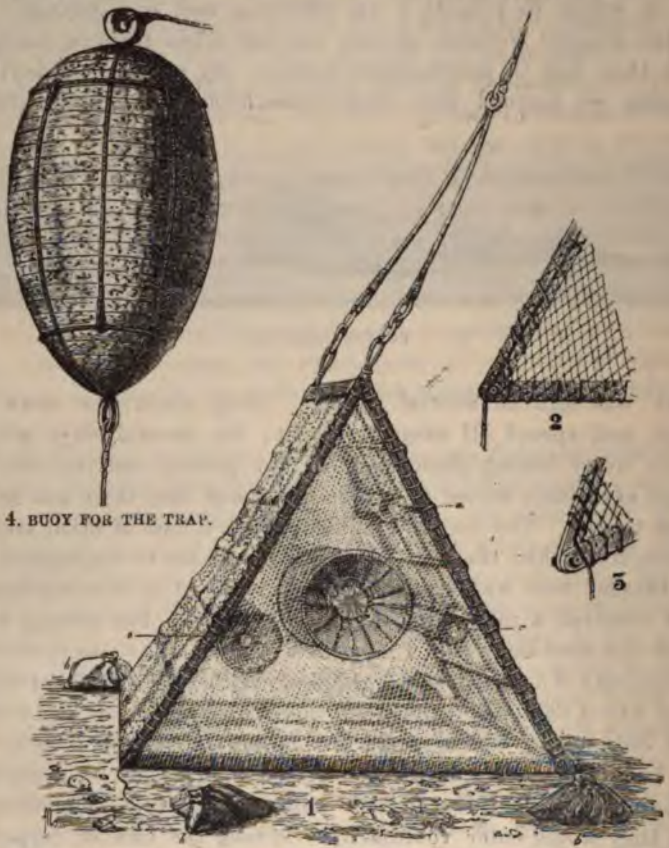
* Most of the data laid down in this first part of the lecture, when their origin is not plainly mentioned, are the views of Murray, Buchanan, or Thoulet.



BOTTOM DREDGE.

One day it occurred to me that there must be some lively animals in the deep water which would not be stupid enough to get caught by a bag dragged across their territory in a cloud of mud, and I had the idea to send down to these supposed creatures, something into which they would enter voluntarily. It took the form of traps baited with the most delicate morsels which we could offer, such as salt fish, sheep's offal, or the intestines, heads, and claws of fowls. Sometimes we even soak these viands in a sauce made of assafœtida, which seems to have an attraction for some marine animals, proving once more that there is no accounting for tastes and colours. I always have some bright objects hung amongst the bait suspended in the trap, such as bits of looking-glass; these are especially attractive to Crustacea, though I have not yet observed that this applies particularly to those of the fair sex. The traps are large enough to hold four or five people, and are made of netting and wood, being so simply constructed, that we can make them ourselves on board. As they are pentahedral in shape they always lie well on the bottom, no matter on which of their principal surfaces they fall.

Among animals, as among men, the stronger devour the weaker, a reflection which has forced itself on me more than once on picking out of my traps the heads, tails, fins, or antennæ of animals which had been devoured by others stronger than they, before the latter saw that they were themselves prisoners. It occurred to me one day to put smaller traps inside the large one, to serve as shelters for the feeble and the hunted; by this means many innocents have been preserved—in the interests of our laboratory. It is, however, also true to say that with animals, as with men, the weak often collect together in vast numbers in order to paralyze a single stronger individual, and overwhelm him without risk to themselves. Thus in the Bay of Biscay, a trap sunk to


4. BUOY FOR THE TRAP.

POLYHEDRIC TRAP. 1, GENERAL VIEW: *a*. SMALL NETS INSIDE THE LARGE; *b*, BALLAST BAGS. 2 AND 3, THE ENDS OF CONDUCTOR.

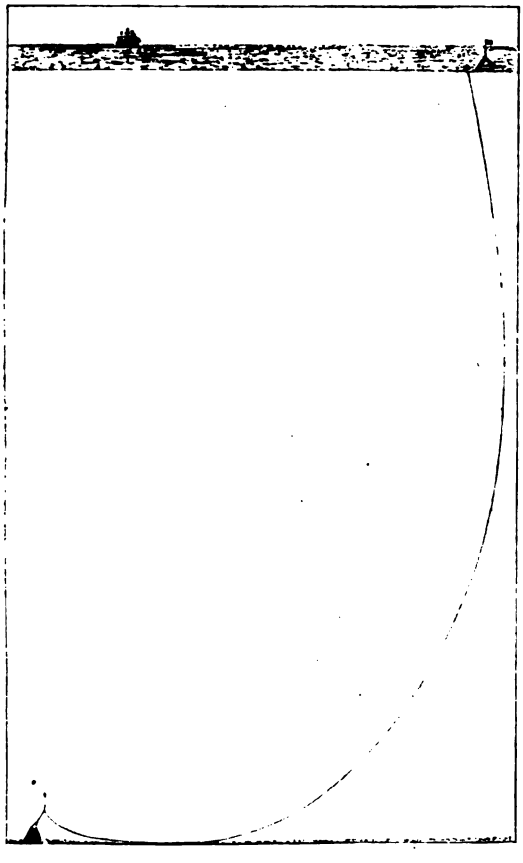
a depth of 1455 fathoms brought up a dog-fish 32 inches long, which collapsed like an empty bag when laid on the deck; its soft parts, muscles, and tendons, weighing at least 8 lbs., had been completely devoured in the space of twenty hours at most by minute crustaceans, many of which came up in the little traps, while others were still enclosed in the bag which they had made out of their prey. Does it not seem as if we men, who, for the purposes of our political life, exploit the passions, the weaknesses, and the quarrels of our fellows, have sought savage examples in these depths? The best lesson taught by science will always be, How vain is the pride of man!

The traps are lowered to the bottom by a cable smaller than that of the trawl, composed of twenty lengths, each 277 fathoms long, and detachable at the point required by the depth. The detached end is made fast on a buoy of greater or less power, and the whole sent overboard, with a flag visible at as great a distance as possible, so that the apparatus can be easily found.

But an operation of this nature presents many complications, and I had to spend several years before I had rendered it easy. While the apparatus is descending, the cable, which has a density higher than that of the trap, must be paid out at such a rate that it shall not sink more quickly than the pot, otherwise the operation would terminate in irreparable disorder. Further, when the trap arrives at the bottom, the ship must be kept at rest vertically over the cable, in spite of wind, or current, or sea, during the time required for detaching the length of cable paid out from the reel, and attaching the end to the buoy; for if the trap were dragged over the bottom, especially in rocky ground, it might be seriously damaged. Again, it is important not to lose sight of the buoy, because, if bad weather were to come on, and astronomical observations should be impossible for some days, one might be detained indefinitely in the region. I have, therefore, adopted a system of lighting by means of very powerful lamps, which are fixed to the signal mast, sometimes to the mast of a boat, which is moored to the buoy. In this case I can keep it in sight all night.

I have, however, had many annoyances in the course of these operations. One day I had let down my trap in the middle of the Bay of Biscay, in 2777 fathoms of water, without remembering that I was in the track of steamers going from Northern Europe to the Mediterranean or Africa. In the evening, as we were watching with satisfaction the swaying buoy with its brilliant illumination, a passing steamer altered her course to see what this light on the surface of the water could be, for no fishing-boats come so far from land. Shortly after a second steamer did the same, led by the gathering of lights to suppose that a disaster had occurred; and, finally, a large liner also stopped to make inquiries. The swell was heavy, and I dreaded a collision, for we were like moths round a lamp; it needed some care to keep ourselves clear, but we managed it, and these curious vessels never understood what it was all about.

The traps have brought me many interesting creatures, which I have got by no other method. Notably last year a new amphipod of great size entered, along with a fish and other crustaceans, one of these traps, which I had sent down to a depth of 3000 fathoms, in a deep basin situated 500 miles south of the Azores, to which the *Challenger* Commission had been good enough to give my name. *À propos* of this, I may say that my flag has actually floated over this colony, acquired for my country, because I flew it for twenty-four hours on the buoy, which was in direct communication with the ground. Seldom, I will add, has a colonial expansion been achieved under conditions less dangerous to the peace of the world; and no one has as yet protested against my attempts on this territory placed 3000 fathoms below the surface of



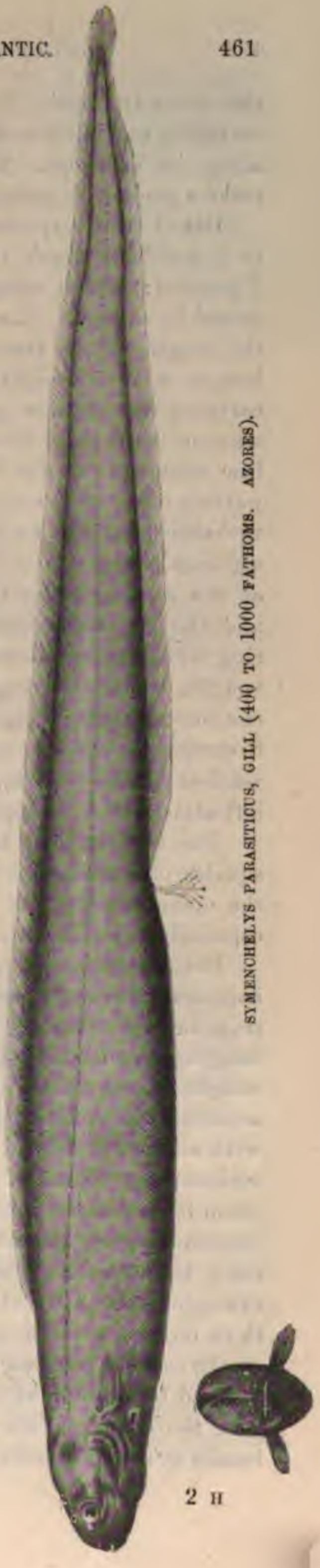
SHOWING THE TRAP ON THE BOTTOM, WITH BUOY AND FLOAT ON THE SURFACE.

the sea. Besides finding creatures new to science, my traps have enabled me to demonstrate the abundance of life in some parts of the great floor of the sea. Thus, last year, one of them placed in a depth of 700 fathoms to the south-west of the Azores, brought up 1198 fish, called *Symenchelys parasiticus*, a species very little known before my researches with the traps, which exists only in one or two collections. Analogous cases met with in other places make me think this fish is one of the most widely distributed animals in great depths, at least between 300 and 1600 fathoms; it would also be one of those having a vertical range of greatest extent.

Near certain islands of the group of the Azores, a trap brought up sixty-four crabs of a new species, named *Geryon affinis*. These are of enormous size, and some which had not found the mouth of the trap when it began to rise, actually made the journey voluntarily on the outside of the apparatus, and were still clinging to it when it was hoisted on deck. What motive could have induced these animals to face the dangers of such a voyage across spaces of continuously decreasing pressure, the temperature of which rose at a rate extraordinary for them, whilst the light of the sun blinded these creatures, accustomed only to the pale glimmers of phosphorescence?

As they are fitted only for walking, and in no way for swimming, I imagined that they must have experienced all the doubts and terrors of a man whom the ascent of a balloon has surprised, still holding on to some accessory of the car, and who has hesitated at the first moment to let go. Such a mishap could never happen to *Polybius Henslowi*, the swimming crabs of the Bay of Biscay, of which the trawl made me such a magnificent present.

During the last two years I have tried in deep water an instrument which gives the best results as regards the variety of species it brings up on the inshore fishing-grounds;



SYMENCHELYS PARASITICUS, GILL (400 TO 1000 FATHOMS. AZORES).

this is the trammel. This net, several hundred yards long, must stand vertically extended on the bottom by lead along its foot rope, and cork along its headrope. The animals, while trying to cross through it, make a pocket for themselves and are caught.

But I have experienced great difficulty in sinking properly and to a sufficient depth these nets, which are very fine. This is how I proceed: A first cable is anchored to a weight of 200 lbs., and supported by a buoy. The ship then moves away to a distance equal to the length of the trammel, then a second cable is sent down to the bottom with a weight equal to that attached to the first. A boat carrying the net now goes to the buoy in order to fix the end of the trammel to a ring, through which the cable is rove and is held by a line made fast to the buoy. The boat now returns towards the ship, putting over the net and keeping it as well stretched as possible until the other end can be fixed in the same way to the second cable. A signal is now given, and a boat at the buoy lets go the ring of that end at the same moment that the ship lets go the ring at the other end, and the net sinks quietly. To minimize the risk in taking up, the ring which passes down from the first buoy is kept down by the weight, while the ring on the second cable is wide enough to clear the corresponding weight; thus the only function of the second cable is to stretch the net taut on the bottom. As soon as we suppose the net has reached the bottom, the guide-rope is hauled in, and the first rope alone left attached to the apparatus.

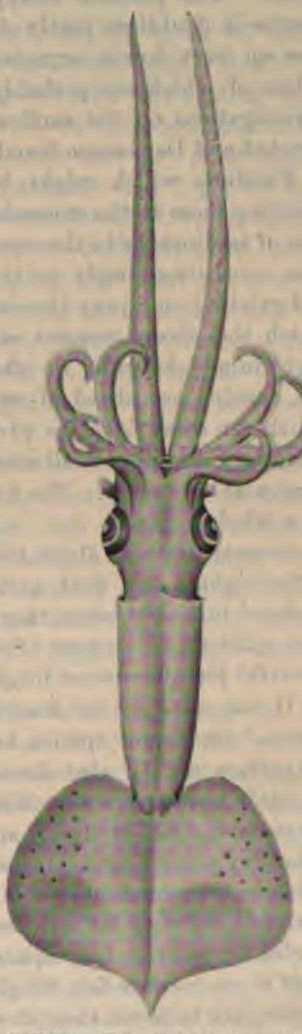
The trammel-nets have already given me very good results, notably squales of considerable size, but it can be imagined how complicated the operation becomes when carried out at depths of 1500 fathoms, especially if bad weather comes.

But you will, no doubt, have wondered more than once if it never happens that heavy and cumbersome articles, such as the trawl, the trap, or the trammel, do not break the cable which holds them, by hanging upon some obstacle on the bottom, or simply by their own weight or resistance. Unfortunately it is so, and I could tell you of accidents of the kind which have cost me thousands of fathoms of cable with all that it carried; but I have greatly diminished the number of accidents by means of an instrument through which the cable passes when it leaves the water in heaving up, and on the dial of which the tension at every instant is indicated. If the strain becomes excessive, cable is immediately let out, and the ship suitably manœuvred. For example, when a trawl catches on the bottom, the yacht steams round it in circles, which may be miles in radius; in this manner strain is put on the cable at various angles until the obstruction gives way, or we are reduced to a last effort to break it at a weak spot, provided for on purpose, near the trawl. Notwithstanding every care, it happens that the cable breaks at an intermediate point.

These are the chances in a struggle which I always return to, and in which I have embarked all the energy of my being for the last fifteen years. We have, however, special forms of instruments for dredging on rocky bottom, where a trawl would certainly be lost. These are bars of soft iron fitted with swabs. The oakum, in passing, hooks everything that is thorny or angular, such as corallines, sponges, hydrozoa, echinoderms, crustaceans. Sometimes even an over-bold fish pays for its curiosity; it remains hooked by its teeth or its fins.

The intermediate regions between the surface and bottom of the sea are the most difficult to investigate, because their inhabitants are undoubtedly good swimmers, very suspicious, and already provided with abundant food. Further, if we would know precisely the level at which an animal brought up by the net was caught, it must be possible to open and close the net at will. At present only one trustworthy method of doing this has been invented, and it is not easy to make the opening more than a few feet wide; that is to say, very large animals cannot be taken. We have already learned from its use, however, that a whole world of fishes, molluscs, annelids, medusæ, cephalopoda, and crustaceans come to the surface at night, and return before day to a depth of some hundreds of fathoms, forming a living tide which ebbs and flows in every sea.

Experience enables us to recognize broadly whether any given creature comes from the bottom or from an intermediate depth. Those which are never found on the surface or on the bottom, generally show a crystalline transparency and low specific gravity.



CHIROTEUTHIS GRIMALDII, JOUBIN (AZORES. 750 FATHOMS. REMARKABLE FOR ITS THERMOSCOPIC ORGANS PLACED ON ITS FIN).

For reasons connected with temperature, some fishes live at variable depths. The Norwegian scientist, Mohn, found lately that the occasional disappearance of codfish from certain parts of the Norwegian coast was due to the fact that these creatures follow a zone of a particular temperature, in which doubtless they find their food. If the fishermen had let their lines go a few fathoms lower, they would have found cod in abundance. Mahn taught them the value of searching for the shoals with a thermometer. The periodic disappearance of sardines from the coasts of France is doubtless partly due to similar circumstances. These fish live on very lowly organisms of minute size, called Peridinia, the habits of which are probably largely influenced by temperature. In investigations on the sardine, made by us off the Spanish coast, MM. Pouchet and De Guerne found in the intestine of a single fish a number of Peridinia which might be estimated at twenty millions, without counting those in the stomach and œsophagus. It is certain that in the case of sardines, as in the case of whales, feeding is an unconscious process, consisting simply in the fish swimming about with open mouth, and existing on a prey the size of which they cannot appreciate. If we watch the phosphorescent surface of the sea in the early part of the night in mid-Atlantic, we often see, as it were, a vast and permanent fan, opening out ahead of us in lines of fire. These are shoals of fish, which run away from the advancing ship, the species of which remains a mystery, in spite of all attempts to catch them, and in spite of their incalculable number. We have often steamed or sailed through them for a whole night.

Several times, in about 48° N. lat., we saw, in spite of the obscurity of the night, a vast field, quite black, that the undulations of the swell rendered luminous when they made the elements of it oscillate. These were millions of medusæ (*Pelagia noctiluca*), each of them carrying a powerful phosphorescent brightness under their cupula.

It has come to our knowledge, almost as it were by chance, that some of the larger species herd together in great numbers far below the surface, and far also above the bottom. Early in the morning, before the birds have begun searching for their food, we often find, floating on the surface, dead or dying animals of species we are unable to procure under any other circumstances. Ought we to see there deep-sea species, which had ventured into levels too high for the pressure of gases contained in their blood and in their swimming-bladder, and had been suddenly carried upwards by the expansion of these gases? This idea suggested itself to me because fish caught at great depths in my traps float at the surface like balloons, their stomachs being sometimes pushed forward out of their mouth by the dilatation of their swim-bladders. On the later expeditions I have hunted the large cetacea, because they seek their food among this bathypelagic fauna, and we often find in their stomachs entire specimens of the animals mentioned. The sperm whales, grampuses, globicephalus, and orca, or other large creatures, have thus constituted my private falconry, although they have not always shown a very nice temper.

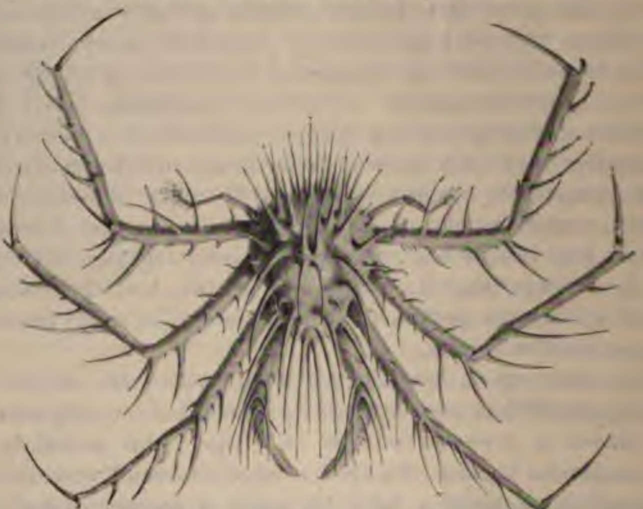
We must fire at them harpoon guns to make them abandon the contents of their stomachs, and we witness then formidable vomitings in the middle of which surprising animals are ejected in a large pool of blood. Nearly all the animals obtained are new, or at least extremely rare.

Giant cephalopods constitute almost entirely the spoils of these combats, where we find, besides, very rough adventures. And if I estimate the quantities of these animals spread over the regions that we explore with such difficulty, by what I see on such occasions come out of stomachs filled like barracks, I conclude that they must be the masters of entire kingdoms. The most remarkable that I got by this somewhat violent proceeding is the *Lepidoteuthis Grimaldii*, which cannot be classified under any known species, genus, or even family of its order. It was vomited by a sperm whale in 1895, under the stern of the ship, but had, unfortunately, been decapitated during the violent scenes in which it had lost its life. One could hardly reproach it for that. The body is trumpet-shaped, with a circular fin, and the visceral bag is covered with large prominent scales, arranged in spiral lines, and forming a protective cuirass.

The same sperm whale gave us a *Cucioteuthis*, another immense cephalopod, with arms as strong as a man's, and carrying suckers armed with claws as powerful as those of a tiger; this animal is furnished with luminous organs. In 1897, a large cetacean I was attacking with a whale-boat, vomited a large fragment of another cephalopod, which was peculiar in being of a viscid substance not unlike glycerine; no net could retain it, and we only secured it by "dipping" it up with a large tub, with all the water surrounding it.

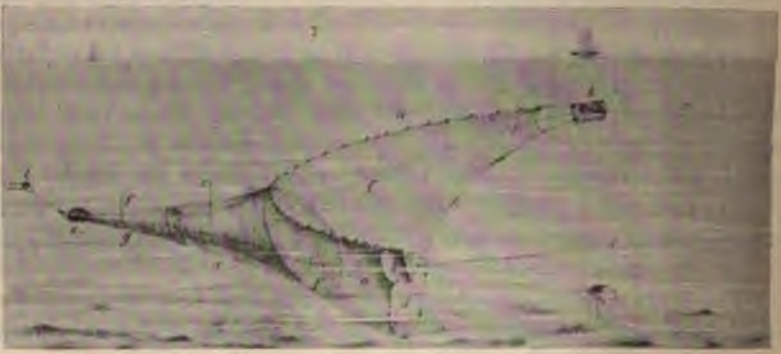
Besides the cetaceans, other less formidable animals assist us in collecting samples of the bathypelagic fauna. The tunny fish, which I have found widely distributed over the North Atlantic, feed far below the surface, and their stomachs yield small fish, cephalopods, crustaceans, and pelagic molluscs. They are caught by means of lines towed behind the ship when steaming at a moderate speed, the single hooks being baited with a cephalopod made of maize leaves. So as to be surely warned when one of them is taken, we attach the line to the spring of a bell, whose resistance yields to the weight and to the efforts of the tunny, and which rings then vigorously. Therefore, among all the inhabitants of the sea who pay a visit to my laboratory, this is one who makes his entrance the most correctly.

There are some animals whose forms can show how much nature is capricious in distributing beauty among the beings that she has relegated to the depths. *Halosauropsis macrochir*, from the deep water at the foot of the Azores plateau, carries luminous organs on twenty-five scales placed along the lateral line on each side of its body—real lanterns, of which the light can be hidden at will by means of an opaque black membrane. This fish was known before only by some imperfect specimens. The *Photostomias Guernei*, which is new, is also provided with luminous organs, two on each side of the head, and two lines of them along the body; it was obtained near the Azores, at a depth of 620 fathoms. Off the bank of Newfoundland, at 690 fathoms, we got a new crustacean, *Neolithodes Grimaldii*, with a bright red body protected by formidable rows of spines on the carapace.



NEOLITHODES GRIMALDII, M. EDWARDS AND H. BOUVIER (NEWFOUNDLAND. 650 FATHOMS).

The small surface forms which cover the sea during the night are collected in vast numbers by means of a large floating net, composed of wide-meshed wings kept open by a wooden plate attached to the end of each; a silk body of finer mesh; a bottom of the finest silk gauze; and, lastly, a zinc bucket, in which the fragile catch accumulates and is protected. When this apparatus is towed along at a speed of about 1 mile



SURFACE DREDGE.

an hour, it sweeps the sea with an opening 9 or 10 yards in width, and acts very much in the manner of a net called otter-trawl. At the end of half an hour it usually contains a pulpy mass sufficient to fill a large basin, from which it is strained through silk funnels, and preserved with suitable reagents. Of the remarkable forms obtained in this manner, none has impressed me more than a rare annelid several inches in length, which is so transparent that when placed in a glass basin under the rays of a powerful electric lamp, its presence can only be detected by the disturbance its progress creates in the crowd of other animals: it is discovered, as astronomers discover a star, by the perturbations it brings in its neighbourhood.

There is quite a world, perhaps that of the æsthetes of the sea, which obeys the seductions of artifical light when, on a dark night, I light up the surface of the ocean with an electric lamp. Thousands of creatures rush then as if to bathe themselves in the rays, and again I reap an abundant harvest.

There are also numerous brotherhoods very practical, to which one belongs on the condition of living only by somebody else's work: those of the parasites. They include representatives of most of the great sea-families, and show much intelligence in selecting advantageous positions to catch the best morsels, and much philosophy in accepting the necessary drawbacks to their mode of life. One would say that they have observed men in their most refined manner of exploiting one another.

Certain isopod crustaceans inhabit the mouth of *Synaphobranchus pinnatus*, a fish found by us in great numbers on the bottom of the Atlantic. They live there sentimentally, in couples, husband and wife I hope, seated one opposite the other near the gills. Their life is passed in a tranquil happiness, in choosing what pleases them of the quite fresh food of their host, and in regarding outside when the latter opens his mouth. At last they grow so fat that the fish can no more close his jaws. How many people do no more than that!

Other parasitic crustaceans prefer a situation which is better protected from accidents from the front; but they have to be content with very light nourishment, for the powerful digestion of a turtle leaves but little for them. Still other parasites penetrate to the internal organs of their hosts: helminthes inhabit the liver, the stomach, or the intestines of their victims; and there are fishes which inhabit the interiors of certain holothurians and medusæ. We recently discovered a *Copepod gallicole* which, if lazy, is at least not greedy; it inhabits the outside of the shell of a sea-urchin. An elongated crustacean plants himself in the cornea of the sunfish's eye, protruding his ugly person therefrom. It is not that one that I should advise you to choose if you had to replace the parasites which actually find their delights in humanity.

Between the parasites, properly called, which live on the substance itself of their host, and the messmates who content themselves with gnawing something from his repasts, the number of the animals governed by this *régime*, of protectorate more or less confined, is so considerable that I cannot speak to you more of them without finding myself led much too far. So I will limit myself now, announcing to you an observation of general interest while the doors are opening themselves to put you at liberty.

My investigations have proved that an abundant fauna inhabits the surface waters of the sea both by day and night; also the thought has struck me very often how many shipwrecked people who died of hunger after having wandered in their boats, might have been saved if they had known this fact, and possessed the means, very simple, of procuring some scraps of this fauna. As we have just seen, tunnies can be easily caught by means of a line carrying a rough artificial bait. Floating spars, casks, driftwood, and the like, attract shoals of fish, especially when they have become well covered with attached organisms. I have caught fifty *Polyprion cernium*, weighing 308 lbs., from a shoal in less than half an hour. The spar they were following might have served a shipwrecked crew as larder for a week. Once we harpooned a moonfish weighing nearly 650 lbs., which would have capsized my boat if I had not been able to immediately take a turn with the line round the spar. On another occasion, when out in a small dinghy, I was capturing again polyprions—and with great satisfaction, for we had just rescued a crew of shipwrecked English sailors, whose ship had sunk before our eyes, and were at the time short of provisions ourselves—when a shark twice as long as our boat appeared, raised his body and looked at me with his cruel eyes, and then settled under the boat, rubbing his back against the keel. Fortunately, I resisted a first impulse to provoke a combat which would have been very unlikely to end in my favour, and made direct for the ship, escorted for some distance by the monster.

There is no very obvious explanation of the fascination any floating or drifting object seems to have for marine animals of all sorts. I have often observed it as well with turtles, whose brains are very poor, as with large cetaceans, whose intelligence appears relatively powerful, and which obey the attraction of a buoy or even of a ship, at least the species which have not yet been scared by whalers. Any kind of apparatus brought up from the depth, even a cable-end, is often accompanied by single fish, or small companies, which get hopelessly bewildered when the object disappears out of the water. Meanwhile we content ourselves with stating the fact, and adding the suggestion that all ships' boats should carry a harpoon and lines, or similar tackle, for keeping up the supply of provisions.

I feel a sentiment of true sympathy in relating all these things to an English audience, to give them an idea of our efforts, for England has always furnished great examples to sailors. It has also given me a collaborator extremely useful and devoted, in the person of Captain Carr, of the Naval Reserve, who shared with me for seven years the labours of which I have just given you a sketch in rough outline.

Before the reading of the paper, the CHAIRMAN (Sir Charles Wilson) said: We are honoured this evening by the presence of H.S.H. the Prince of Monaco, who has very kindly come here to give us the result of his work during the last fifteen years. Every year His Highness devotes from two to three months to the examination of phenomena connected with the ocean, and his labours have resulted in valuable contributions to the science of oceanography.

After the reading of the paper, the CHAIRMAN said: Before asking you to return a vote of thanks to H.H. for his interesting and valuable paper, I will, with your permission, read a letter from the Swedish minister to Sir Clements Markham [printed in June number]. I can only say that I hope our own Government will join in this useful work. What the Prince has said to-night shows us that we have still much to learn with regard to the habits and food of fish. It is so late that I will not invite any gentleman to discuss the question, but will ask you at once to return a very cordial vote of thanks to His Highness for his paper. We must all wish that the new *Princess Alice* may be as successful as her predecessor has been, and I feel sure that in a few years' time we shall have results more valuable than those that have been communicated to us this evening. There is one point to which I should like to allude. I believe that most of the traps and the different instruments that we have seen on the screen this evening have been elaborated by His Highness himself and by members of the very valuable staff which accompanies him on these expeditions. I trust that you will allow me to thank His Highness very cordially in your name for having presented the results of his voyages to us in such a pleasant manner. I am glad to find that his voice has lasted so well throughout the evening, and I may add that we have all been greatly pleased and delighted with the fluent English in which his communications have been made to us.

EXPLORATION ON AND AROUND ACONCAGUA.*

By E. A. FITZ GERALD.

THE High Andes of Argentina, in the province of Mendoza, run, as you all know, north and south, in three great ranges parallel to one another. The western range forms the water-parting and boundary between Argentina and Chili, while the centre range contains the highest peaks. The eastern range is divided from the centre range by a wide and flat plateau at an altitude of about 4000 feet above the sea, known as the Uspallata valley. Aconcagua is situated in the centre range, about 5 miles east of the water-parting. Though the mountain itself can be plainly seen on a clear day from the Pacific coast, yet all the snow and water that falls on this huge mass drains off to the South Atlantic ocean, some 700 miles distant. The object of our expedition was to climb Aconcagua, if possible, and to find out accurately its height, as well as to map as much of the surrounding country as we could. Several attempts to climb this mountain had been made, among which I would most particularly cite that of Dr. Güssfeldt, who attacked Aconcagua from the north side. This eminent German explorer was unfortunate in losing his guide, who fell ill in Valparaiso, and he was thus handicapped and compelled to attempt the ascent with a mere boy; he, however, did much in elucidating the geography to the north of the mountain, and also climbed the extinct volcano San José de Maipu in the south. Besides myself, our party consisted of Mr. Vines, Mr. de Trafford, Mr. Philip Gosse, my guide Zurbriggen, and five porters that I had engaged in Switzerland. I should here add that Mr. Lightbody, one of the engineers of the Trans-Andine railway, joined me soon after I arrived in South America. We left England on October 16, 1896, and arrived at Buenos Aires three weeks later.

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* Paper read at the Royal Geographical Society, March 28, 1898. Map, p. 552.

Our work was almost entirely confined to the Argentina or eastern side of the water-parting. Our equipment and luggage, amounting to some eight tons in all, we took from London to Buenos Aires by boat, and thence on by rail to Mendoza, the last station of the Argentine Great Western railway. It is from this point that the Trans-Andine railway starts. While this was being done, I took the opportunity of visiting the observatory at Cordova, and testing all our instruments carefully, including the aneroids.

We all assembled in Mendoza, where we procured a troop of some twenty-five mules and horses, and then travelled up to Punta de las Vacas, the terminal station of the Trans-Andine railway.

It was, and is still I believe, the intention of the promoters of this line to run it through to Santa Rosa de los Andes, in Chile, there to join the government railway. There is as yet, however, only 75 miles finished on the Argentine side. The Chilian part has been constructed as far as Salto del Soldado, a matter of some 18½ miles. There remains, therefore, some 44 miles to finish. This, however, will be the most difficult portion of the line to construct, as it will involve a tunnel under the Cumbre pass, the summit of which is 12,795 feet above sea. The line is a metre gauge, with rack and pinion for the steeper grades. It is much on the same principle as the railway from Visp to Zermatt, in the Swiss Alps.

The first few weeks of December we spent in reconnoitring the Vacas and Horcones valleys, so as to decide upon the best side from which to attack Aconcagua. We finally decided to try the Horcones valley, as it was the shorter, and the river was better for fording purposes.

The lantern slides I propose to show you later will, I hope, give some conception of the extreme dreariness of the region. What little vegetation there is about the lower slopes of the valleys ceases above 12,000 feet. Roughly speaking, no rain falls during the summer months, so the herbage is confined to places near river-beds and close to natural springs. The most terrible winds prevail during the dry season, and sand and dust fly about in a way that almost blinds one. The wind rises, as a rule, about two hours after sunrise, and continues till just upon sunset. It can be easily imagined that, with such conditions, any work with theodolite or plane-table is extremely difficult. The fine sand flies into the verniers of one's instrument, and scratches the plates terribly; while anything in the way of a sketch with a brush is out of the question.

ACONCAGUA FROM THE EAST.

We first turned our attention towards exploring the Vacas valley. Accordingly, Zurbriggen and I started on the morning of December 9, 1896, to ride up it. We had our first experience of fording Andine rivers here. Throughout our work we found this one of the most difficult and dangerous obstacles to overcome. In the afternoon, when the sun has melted the snow from the sides of the mountains, the rivers rise to such an extent that it is impossible to cross them. They have to be negotiated in the early morning, or after eleven at night, when, owing to the frost, the water begins to subside. The Vacas valley, as we found afterwards, is one of the most fertile in this region. We were, however, at the time ignorant of that fact, and I must say it seemed to us about the most desolate spot imaginable. It was not till the second day that we reached the head of this valley. The upper part of it is flat and wide, there being no vegetation—nothing but a dreary vista of yellow sand and stone, the only relief from this being the multi-coloured stratification of the rocks on the surrounding mountains. From here we saw a great peak towering to the west of us, but at the time we were uncertain what mountain it was. Afterwards we found out that this was the Aconcagua, though our native mule-drivers stoutly denied it.

On returning to our camp at Vacas on the following day, I decided to make a trip to the Horcones valley, where, it was said, a great mountain was visible, supposedly a spur of Aconcagua. The native people of the Andes are vague in their ideas as to where the mountain really is, and I have never met a mule-driver, or arriero, as they are called, who would admit that any peak was really Aconcagua. They say it may be a rib or spur leading to a buttress of what might be a peak *near* to Aconcagua, but nothing more.

We spent the next few days in moving our base camp to a spot near the mouth of the Horcones valley, close to Puente del Inca. This we considered would be the most central point from which to base our operations for the attack on Aconcagua.

Upon December 23, I started with Zurbriggen and four of the men acting for me as porters, viz. Louis and Joseph Pollinger, Lochmatter, and Lanti, together with two horses and ten mules, to make an attempt upon our mountain. I had previously sent Zurbriggen up this valley to see how the land lay, and he had reported to me the possibility of taking animals to the head of the valley. From here, he said, one could easily reach the north-west shoulder of the mountain, and form a camp at about 19,000 feet. This, we thought, would make a good starting-point for ascending the peak.

After the first 12 miles up the Horcones valley the pasturage ceases, and the aspect of the country assumes that of a vast wilderness of sand and rock, the valley being blocked in places by the remnants of huge moraine heaps. The first time we rode up this valley we had great difficulty in getting our animals through, as there was of course no track. Later on, we constructed a pathway over the most difficult and dangerous places, and thus saved ourselves much trouble and danger. We reached the head of the valley upon the same day that we started from Inca. It was about 14,000 feet high here, and we found it impossible to take our animals further, owing to a great glacier that fills the head of the valley; so, after selecting some things from our luggage, we sent our animals back to the base camp at the mouth of the valley. We then pushed forward on foot to an altitude of about 16,000 feet, where we slept for the night. It was at this point that we had our first experience of mountain sickness. The day had been a hard one, and the mid-day sun powerful, so we were reduced to such a state of collapse by the time we got to our proposed camping-place that we were unable to put up our tent. We crawled into our sleeping-bags side by side on the bare unsheltered mountain-side, among loose stones and rock, and attempted to get what rest we could, totally unable to shelter ourselves from the wind which raged about us. None of us slept for long, and Lochmatter, one of our porters, was very ill during the night. As dawn came the weather got intensely cold; even in our bags we were unable to keep warm. As soon as the sun touched the tops of the mountains opposite, we tried to prepare a little warm food. This we found impossible, owing to the apparatus we carried for heating our food having struck work. It had been thoroughly tested in London before our departure, but either the spirit was bad, or the rarefied air gave an insufficient supply of oxygen.

SOUTH-EAST PRECIPICE OF ACONCAGUA FROM GLACIER.

As we learnt from subsequent experience, it was a great mistake attempting to do anything till the sun had actually risen over us. The great mass of Aconcagua being directly to the east, and rising at an abrupt angle, the sun did not strike our camp till about two hours after its rise. Meanwhile we got thoroughly chilled, and, being unable to get any hot food, we were all practically incapacitated for reconnoitring. The result was that the whole day was spent moving our camp some 1000 feet higher, and getting more provisions from the camp below. We succeeded in getting our little tent pitched at about 17,000 feet, and spent the night there. After twelve miserable hours spent in a very cramped place—for our tent was only 6 feet square, with a sloping roof ending in a peak 4 feet from the ground—we crawled out upon Christmas morning. One man made a feeble attempt to greet me with a "Merry Christmas;" I, however, replied that to my mind it was *not* a merry Christmas, and that was the last word upon the subject.

As we were still in need of several things, I thought it best to send a man down to our lower camp, that he might bring up some provisions and equipment, while I spent the day in making an excursion higher up to look for a suitable place to move the camp to. Being unable to cook anything, we were reduced to eating some tins of Irish stew cold, slowly melting the lumps of white frozen grease in our mouths. The natural result of this was violent fits of nausea.

It was with great difficulty that Zurbriggen and I climbed up during the day to an altitude of about 19,000 feet; we were fortunate enough to find, on our way, a sheltered spot under a hollow rock, where we could pitch a tent. On returning, I decided to move the camp there on the next day. This we accordingly did, and at an altitude of about 18,700 feet made our permanent base-camp, from which all subsequent attempts to climb Aconcagua started. One of our aneroids at this altitude went down to 12 inches, the minimum to which they were graduated, and then ceased to act in a most unaccountable way; another worked fairly well, but registered about three-quarters of an inch lower than it should when compared with the mercurial barometer, allowing for the error by its Kew test. In the afternoon we got a first view of the South Pacific ocean, lying at our feet 100 miles distant. Although it was fairly warm in the sun, our maximum temperature in the shade was only 27° Fahr., that is, 5° below freezing. Our pulses registered about 120 to 130 beats per minute, intermittent and flighty, while our blood-circulation was extremely bad.

Zurbriggen went up some 2000 feet above the new camp, and came back completely exhausted, having suffered much from the wind and cold. During his scramble he had espied a heap of red stones, evidently built by some one. On closer investigation, this proved to be Dr. Güssfeldt's last cairn. It was at this point that the well-known German explorer—night coming on, and the cold being intense—was obliged to turn back, literally to save his life. We passed a most miserable night at our high-level camp, and as we could not get the spirit in our cooking-stove to burn, we were obliged to content ourselves with cold food again. I decided, therefore, to turn back next morning, as I saw that the only chance of accomplishing anything at this altitude would be by bringing up wood, so as to enable us to cook proper meals. We accordingly retreated to our 12,000-feet camp, situated in the Horcones valley, some 12 miles from the Inca. On December 30 we again came up to the high-level camp, and between this date and January 2nd, made two attempts to scale the mountain. The first time we failed, owing to Zurbriggen getting his feet severely frost-bitten. The second time I was obliged to turn back, owing to extreme weakness and nausea. Finally, we were obliged to retreat to our old camp, and spent a couple of days down there. On the 5th we returned to the attack, making a fourth attempt on the 14th. This time I succeeded in reaching an altitude of about 22,000 feet. We had been stopping for the last few days at our highest camp, and had suffered intensely from cold and want of sleep. On reaching this point (22,000 feet), I found that it was absolutely impossible for me to proceed further. As it was late in the afternoon, I sent Zurbriggen on at once to complete, if possible, the ascent, although myself obliged to turn back. I had the greatest difficulty in crawling down; my knees were so weak that I repeatedly fell, cutting myself with the sharp stones that covered the mountain-side. I crawled along in this miserable plight, steering for a big patch of snow. Here, unable to stand any longer from sheer exhaustion, I was obliged to lie down and roll down the mountain-side. As I got lower my strength returned, the increased pressure of the air seeming to act as a great stimulant. I returned to camp that night with one of the most severe headaches I have ever in my life experienced.

Zurbriggen arrived later on, and reported that he had reached the summit, but was unable to get any view, as a small local snowstorm raged over the peak during the afternoon. He was terribly tired and knocked up, and, though naturally elated at his success, he didn't really seem to care what happened to him during the night. He was also suffering from a severe headache. There was a most ghastly chorus of snores and men gasping for breath during the night, for at this altitude one is obliged to keep one's mouth open to breathe; the result being that the throat gets very dry, and when one stops for a moment to moisten it, a violent fit of choking is the result.

Next day we returned to our base camp at the Inca. On January 19, Mr. Vines and I, with a porter and mule-driver and some pack-mules, started to make another attempt upon the mountain. Zurbriggen was then temporarily disabled by the hardships he had undergone during his previous successful attempt. We bivouacked at 12,000 feet that night, and the next day we reached the 14,000-feet camp. On the 21st, Mr. Vines and I made an attempt to reach our upper camp, but I was obliged to turn back owing to illness. The next day (22nd) we again tried; this time, notwithstanding a tremendous gale, accompanied by a violent snowstorm, we succeeded in reaching our tent at nearly 19,000 feet. Here we spent two nights and a day alone, surrounded by a terrific snowstorm. As the wind had risen to a hurricane, the snow drifted tremendously, and we had a very anxious night, fearing every moment that our little tent would be buried beneath the volume of snow that drifted on to it. As soon as the weather had sufficiently abated, we retreated as quickly as possible to our lower camp, reaching the Inca that night on foot in a blinding snowstorm.

On February 7 we made a fresh start, but, owing to illness, it was not until the 10th that we succeeded in crawling to the upper camp. The 11th and 12th were spent there, but as we were gradually getting enfeebled by the altitude, I thought that our only chance was to make an attempt at once. We did not seem to improve at these altitudes; on the contrary, we got weaker and weaker after every day spent there. On the 13th we, with an Italian porter, Nicola Lanti, made a final attempt to reach the summit. The day promised to be a fine one, so we left our camp at 18,700 feet in the morning. This time I was again obliged to turn back at about 20,000 feet, completely disabled, but I begged Mr. Vines to continue and make the ascent, if possible, that day, taking the porter with him.

He followed practically the same route that had been taken on our previous attempts. Aconcagua now wore quite a different aspect from what it usually does at this time of the year, the whole mountain-side being white with new snow. Zurbriggen had climbed the mountain almost without putting his foot on snow.

At mid-day Mr. Vines reached the spot where, on our first attempt, we had left some provisions and instruments. Up to this point things went fairly well with him, though his speed very much diminished as he ascended.

In order to reach a gully leading to the final ridge, he was obliged to cross a slope of loose stones that stretches over the north-western face of the mountain. Both he and the porter were now in a condition when the slightest rebuff sufficed to damp their spirits, and give them an excuse to sit down and rest. And these excuses were frequent, the whole ground being a steep slope of rotten stones, which gave way with them at every step, so that they were continually falling on their hands and knees. Mr. Vines had suffered very much from the biting keenness of the wind, so when he reached the gully that led to the peak, he hailed with joy the shelter it afforded. This in the end, however, proved more of a hindrance than otherwise, for in that gully, and, in fact, in all sheltered places, he found the labour of breathing greatly increased. He found it necessary to stop and rest at very short intervals now whenever the way was steep. Even on more level ground the rate of going was very slow.

These intervals of rest became more frequent as he ascended, and he found much relief in leaning forward on his ice-axe, keeping his head as low as possible. Zurbriggen's experiences were much the same at this height.

After about 300 feet the gully widened out into a huge amphitheatre filled with broken red rocks. In front was the rock ridge between the western peak and the summit. The summit was on the left, a cliff running from it, while on the right high cliffs towered above him. This was certainly the most trying part of the ascent. After frequent rests, they reached the great rock ridge, and gained a first view of the country to the south. They both experienced relief on reaching this spot. There seemed more air to breathe than in the sheltered route they had come by. Clouds kept rolling up from the north-west, and were now nearly touching the second or western peak. The air was bitterly cold, the thermometer registering 7° Fahr., or 25° below freezing. The summit was observed to be in the shape of a square plateau, 75 paces each way, sloping at an angle of 7° towards the north, and entirely free from snow. Mr Vines found that Zurbriggen had built a substantial pyramid out of the loose stones lying on the summit. At the foot of this, after setting them, he placed maximum and minimum thermometers, leaving them sealed up in a tin case.

HORCONES VALLEY, LOOKING SOUTH DOWN FROM HEAD OF VALLEY.

The western and north-western sides of the mountain fall away at an angle of 20°, and are composed more or less of great slopes of loose stones, which are kept clear of snow in summer by the winds that sweep them. To the south and south-west the sides are more precipitous, also fairly clear of snow and ice; but to the south-east there is an enormous precipice of nearly 10,000 feet covered with great overhanging masses of snow and ice, forming one of the most imposing sights imaginable. Looking down this dizzy precipice, Mr. Vines saw below him spurs of the mountain flanking the glacier beneath to the right and left, giving it the appearance of a huge amphitheatre. The sun was now not far off the horizon, and did not penetrate into this vast pit. Great masses of vapour were moving about in it far below, giving it the appearance of some giant cauldron, it being almost impossible to see the bottom, 2 miles vertically below where he stood.

The sky was still clear to the north. To the north-west the line of the Pacific stood up high in the horizon, stretching away for over 150 miles. Range after range of mountain could clearly be seen between Aconcagua and the ocean. He seemed to look right down into the valleys between these ranges. The first striking feature to the north was the Val Penitentes, beginning in glacier, and stretching for 15 or 20 miles in a straight line to the north. Forty miles away, following the line of the Val Penitentes, stood the great snow mass of Mercedario, towering above all the surrounding ranges. The southern side of this peak is a gentle snow-slope, while the northern side would doubtless consist of slopes free from snow, as was the case on Aconcagua. Of the pampas or great plains of Argentina he could see nothing; there were too many ranges of high mountains between Aconcagua and Mendoza to make this possible. But to the south the clouds, fortunately, were not high enough to cut off the magnificent view of Tupungato, and the great range to the north of it, with the beautiful peaks of Pollera, Navarro, and Juncal, which so distinctly mark the boundary-line between the two republics. The eastern side of Aconcagua sloped down to the great bare wastes at the head of the Vacas valley, which ended in glacier. An easy passage for mules could be made over from here into the Penitentes valley, and so to the north. The clouds soon lifted in the Horcones valley, and cut off all possible view of Tupungato; other clouds were gathering round the western peaks. It was too late to remain longer—it was 6.30—and Vines did not relish the idea of being caught by night at such an altitude. As it was, they would have to rely on a clear moon for the greater part of the way. The descent to the gully over the great stones that lay everywhere was most exhausting, and they did not seem to derive any benefit from the increase of pressure as they descended. The descent from the ridge between the two peaks of Aconcagua to the camp was made in one direct line down the great slope of loose stones, and breathlessness and weariness seemed to continue to the end. They reached the camp at 8.30 p.m.

That night we experienced a very low temperature (3° Fahr.); after sunset the thermometer had gone down with a rush. Mr. Vines arrived with his beard and moustache a mass of ice, in which plight he remained all night. While waiting for their return, I watched a most glorious sunset. The whole Pacific ocean from north to south, together with the sky above, was lit up with a fiery red glow, which changed slowly to purple and then to blue. We were, however, not in darkness, for soon after the sun had set the moon rose and shone brightly, revealing everything with wonderful distinctness in the clear air. And still for half an hour that wonderful glow remained on the horizon of the Pacific, a great red line of subdued fire high in the air.

The next day we returned to Inca. It was then found necessary that all should take a rest after their hardships. Mr. Vines was suffering great pain from having his face much frost-bitten. So we crossed the Cumbre pass into Chile for a few days. On our return, the high camp on Aconcagua was again visited for the purpose of further observations.

SERACS HORCONES GLACIER, NORTH-WEST SLOPES OF ACONCAGUA, BACKGROUND TO RIGHT.

It was getting late in the season, and the weather interfered much with our work at the high camps on Aconcagua. I heard so much about Tupungato and the difficulties surrounding it, from the people of Mendoza, that I particularly wished to see it ascended. I took, therefore, the first opportunity the weather gave to send Mr. Vines to the south to attempt the mountain, while Lightbody and I confined ourselves to the traverse work in the high valleys leading to Aconcagua. Tupungato is a mountain about 22,000 feet in height on the great chain which forms the water-parting, and at the same time the frontier boundary, between Argentina and Chili. It is roughly in lat. 33° 20′ S. and long. 69° 45′ W., 50 miles east of Santiago, and 120 miles from the Pacific coast.

It was at Vacas that Mr. Vines made his head-quarters for the journey. Here it was possible to obtain fresh meat and bread. With Zurbriggen, Lanti, and a native arriero and three pack-mules, he started from Vacas on March 25. A somewhat late start was made, owing to the necessity of reshoeing most of the animals for the rough work before them. They followed the pass road for a mile to the south, to the junction of the Inca and Tupungato valleys, where they crossed the Rio Mendoza. The great main valley mounts up to Cuevas towards the Cumbre pass at a gradient of about 3 in 100. In the Tupungato valley the gradient is much smaller. Travelling was fairly fast at first, but afterwards the track became difficult to find amongst the great stone falls which filled the valley-side right to the edge of the river. This was most trying work for animals, and great care had to be taken, as only the best of the horses were able to cross without getting their legs stuck in deep holes between the great stones, and all came through badly cut about the legs. Up this valley Tupungato appeared as a great dome, almost entirely covered with snow, 30 miles away. Several hours over the *débris* brought them to a narrow gorge, and then the valley broadened out, forming a great plain more than a mile wide, which had formed the bed of a lake. Silting and denudation had filled it up, causing it to force a passage and drain itself. At sundown the party encamped, where there was good pasturage for animals. About 12 miles only had been made this day. The journey was continued from sunrise to sunset on the following day. Soon after starting, a magnificent view was obtained of the great ice-peak of Pollera, about 20 miles away on the frontier boundary.

So far, since the previous morning, the way had been comparatively easy. The main valley ran to the foot of Pollera, and on to a difficult pass over into Chili. The caravan, therefore, had to turn up a tributary valley running down from the south. It was impossible to negotiate this where it joined the main valley, for the rocks rose precipitously from both sides of the river-bed for several miles. A way had to be made direct up the mountain-side about 1500 feet above the river-bed. Here the going was both dangerous and difficult. Pack-mules had to be frequently unloaded where the inside rocks made it impossible for the panniers to pass. One mule fell 150 feet, and was given up for lost. A porter, however, was sent down to look for it and secure the harness. He found the animal, and managed to bring it up again, and it worked well for the rest of the day, lightly loaded, though badly cut about the head, sides, and legs. The valley widened out, and a descent was made to better ground. However, it took the same direction as the main valley, namely, towards the frontier to the south-west, and a second tributary valley had to be penetrated. The going was very slow, as the difficulties of transport continued throughout the day; at sunset only another 15 miles had been covered. While they were looking out for a suitable camping-ground, a large dog fox was put up, and had not got 300 yards from the caravan when a fine guanaco hound, which the mule-driver had brought with him, was in full pursuit. An exciting chase followed up the steep mountain-side. The sport was too good to be lost; and, though the ground would have been voted impossible in any other country, and men and horses were thoroughly tired, the whole party were soon in full gallop down dry torrent beds and over broken ground. This reckless chase ended in a pitched battle between hound and fox, resulting in the death of the latter—a very fine specimen, which Zurbriggen skinned before turning in. The way offered no great difficulty on the third day, though the going was slow. The river had cut down a deep channel in the middle of the valley, the old river-beds rising in terraces 30 to 40 feet high each side, perfectly flat, with growth of Yareta, or Andine thorn, and tufts of coarse grass. This Yareta was of very great use to us in the high valleys for firewood; for, though the branches are low and insignificant, and flare up and burn quickly, the roots are fairly substantial even at 11,000 or 12,000 feet.

THE PENETENTES.

Now the first near view of Tupungato was obtained. About 7 miles as the crow flies from the actual summit, the great dome was seen to rise from the valley, on the southern and eastern sides covered entirely with snow. On the north-western side was a great spur about 3000 feet lower than the dome, running out for 4 or 5 miles from it, almost entirely clear of snow and ice, though there was snow and glacier 2000 feet lower at its northern base. The valley divided here, one branch continuing south, the other south-west for a mile, where it divided again, the two branches running south-west up to the rocks surrounding the great mass of Tupungato, and south-west by west to the frontier.

A great difficulty now presented itself. The valley became barren of vegetation, and inaccessible for further mule transport at 11,000 feet. It would be necessary to sleep a night on the mountain at a much greater height, and the porterage was very limited. A mule was, however, forced up to 13,000 feet, and Mr. Vines and Zurbriggen slept in the open at 14,000 feet. The following morning an attempt was made to reach the summit. The party ascended the great spur at its lower end, and, traversing the whole length of it, reached a height of 19,000 feet. They were too exhausted to go quickly, though the gradient was slight, and it was late in the afternoon when a storm gathered round the summit, hiding it entirely from view, so that they could not find their way in the thick mist which gathered, and were forced to beat a hasty retreat. The next day all returned to Vacas for more provisions, mules, and porters. Throughout the return journey Mr. Vines took careful bearings of the valleys with the prismatic compass.

TUPUNGATO, 30 MILES DISTANT. TAKEN WITH TELEPHOTO LENS.

A fresh start was made from Vacas on April 3, with two more porters and extra transport accommodation. The pack-mules were got off before daybreak, and by forced marches the camp in the valley at the foot of Tupungato was reached in two days. A second attempt was made from the old bivouac at 14,000 feet on April 6. Four started on this occasion. They found an easier route, avoiding as much as possible the tiresome rotten *débris*. On reaching the top of the great spur, they were overtaken by a terrible storm, and all suffered very acutely from the cold and the altitude. One man suffered from violent pains in the legs, which rendered his lower limbs useless, and he had to be sent back. Zurbriggen was very ill, and in great pain. They struggled to a place about 500 to 1000 feet higher than that reached on the first attempt. Here they sheltered under a rock, hoping that the storm would blow over. On the contrary, it increased in violence, and the air became so thick with clouds that all thoughts of waiting longer had to be given up. The party returned to the base camp late at night, exhausted and disheartened. The great distance to be traversed, the effect of the altitude, and the shortness of the days made it impossible to ascend the mountain from so low a level at this time of the year. So, after a few days' rest at the base camp in the valley, a bivouac was made at the height of 17,000 feet, at the foot of the great spur. This time no attempt was made to ascend higher, for a tremendous wind-storm arose in the night, which completely wrecked the little tent, and Mr. Vines with two

TUPUNGATO VALLEY. THE MOUNTAIN IN THE DISTANCE.

guides were nearly frozen. They were sleeping on glacier, and the thermometer stood at 5° Fahr.

Again they retreated to the valley, and rested for a day, hoping for the weather to improve. On April 11, Mr. Vines, with Zurbriggen and a porter, slept at the same bivouac at 17,000 feet. An early start was made on the 12th, and, the weather being bright and clear, they calculated to reach the summit at about two in the afternoon. The summit proved to be much higher and further off than had been supposed, and it was not until four o'clock that Mr. Vines and Zurbriggen reached it. Fifty miles to the north-west Aconcagua stood up alone, like a huge rock out of a sea of lower mountains. There was nothing between to interrupt the view. Mr. Vines took several photographs of Aconcagua, both from the ridge and the summit of Tupungato. The great mass of Mercedario, one of the highest mountains in the Andes, could be clearly seen 40 miles to the north of Aconcagua. To the north-east the Cerro de la Plata stood up from a great mass of high mountains. Turning further from the north and looking due east, the Cerros became very low, and almost disappeared in the low hills sloping down to the pampas, not 15 miles east of Tupungato. The rivers winding through the great plain, and even the railways, could be clearly seen. The southern aspect could only be scanned from the summit. The volcano of San Jose de Maipu was the chief feature in this direction. The great frontier boundary-line, of which Tupungato and its great spur form part, the water-partings of the rivers to the Pacific and Atlantic, were very clearly marked to the north, 40 or 50 miles away beyond the Cumbre pass, and far to the south to Maipu.

Beyond the northern end of the great ridge lay a col covered with snow and ice, rising up to the beautiful ice-peak of Pollera, 19,000 feet in height; then another col, and the great pyramid of Navarro, some 500 feet higher; and beyond the great peaks and glaciers of Juncal, 1000 feet higher still. From Maipu the water-parting runs due north to Tupungato, and then the line of the great peaks turns to the north-west and west to the Cumbre pass, where the water-parting again runs north. While climbing up the ridge from the eastern side, and gradually nearing the top of it, the party noticed a strong, sulphurous, burning smell, and on arriving on the top of the ridge a volcano was seen about 20 miles to the south-west in great activity. The wind had blown from the west, bringing the smell towards Tupungato, but, as seen, it came from the north-west, and great volumes of smoke stretched away to the south. It had the appearance of a great ridge, about 13,000 feet in height, running towards the north, when its height gradually dwindled. A great fissure appeared in the middle of this ridge, from which the smoke poured forth in dark brown volumes. Nothing could be seen of this during the earlier attempts on the mountain, as the view to the west had been obscured by clouds. The coast-line could be seen clearly running for 100 miles to the north.

The breadth of the Cordilleras at this point was 60 miles only. They seem to narrow down at this latitude. The great plain in which Santiago is situated is not more than 45 miles to the west from Tupungato. Those 45 miles between Tupungato and Santiago are filled with range after range of high mountains. But from the top of Tupungato eastwards, a man can look almost down into the great plain of the pampas. North of here the Cordilleras widen out, until at the latitude of 32° 50′ they rise up from Mendoza and continue almost to the sea-coast, a distance of 150 miles.

During the climb up the great ridge, which runs at an angle of about 15° to the summit of the dome, many specimens of rounded stones, hollow or cup-shaped in the centre, were noticeable. These were probably volcanic bombs thrown from the ancient crater of Tupungato, and by the force with which they were thrown up, twisted into this peculiar shape, and hardened before falling. During the ascent the specimens were too large to carry, and the descent we made in the dark, so that there was no chance of collecting any of these stones. On the top of the dome of Tupungato is a great plateau, which stretches over an immense area, and there rises up from it three peaks, that on the far south of the dome being the highest, attaining to a height of 300 feet above the plateau. The whole of the north-western sides of the dome, as also the plateau, are comparatively free from snow, and yet on the eastern and south-eastern sides the mountain looks entirely white. In between two of the peaks on the plateau there lies a great quantity of black volcanic ash and scoria, of which some specimens were collected. The actual summit of Tupungato is a very interesting specimen of andesite, riddled by fulgurites, *i.e.* tubes melted out by lightning. A night was spent on the descent again at the 17,000-feet bivouac, and the valley was reached on the 13th. Mr. Vines and Zúrbriggen determined, if possible, to start at daybreak on the next day, and try and reach Vacas before sunset. They selected the best of the animals, and started before daybreak on April 14, relying on their horses in the pitch dark to find the way for the first hour, and without drawing rein for fourteen hours, except to water their horses at noon, reached Vacas the same day, a distance of nearly 50 miles, over rough and dangerous country. The rest of the time was spent in survey work and measurements, to determine the height of Aconcagua. This we make out at present to be 23,080 feet, but we have not yet worked out all our calculations. Concerning this, Mr. Lightbody will presently give you a more detailed account.

We were driven out of the Horcones valley by a heavy storm on April 30. I forced my way up the valley some weeks later with Philip Gosse. The first night we camped in a terrible snowstorm. It snowed all night, and we considered ourselves lucky to be able to get down at all the next day. The winter snows having now come down heavily, we were obliged to quit our work. Our horses and mules were dying from cold and exposure. It was, however, a long time before we were able to get our luggage, containing the results of our work, down to Mendoza, as the roads were all blocked with snow, and porterage very difficult to obtain.

During this time Philip Gosse fell ill, and for some time we were extremely anxious concerning him. At last, on June 19, Mr. Vines and I crossed the Cumbre pass in midwinter through heavy snow. Mr. Lightbody had preceded us a week before.

In conclusion, I must say that the success of our work was due entirely to the unfailing energy and co-operation of my colleagues, who, through the many difficulties and dangers of our work, preserved an unfailing cheerfulness, and were ever willing to surmount obstacles that at the time seemed well-nigh impossible. It was thus, that after six and a half months of labour, we brought our work in the High Andes of Argentina to a close.

Before the reading of the paper, the PRESIDENT said: It is scarcely two years since we welcomed Mr. Fitz Gerald here on the occasion of his return from the exploration of the southern Alps of New Zealand, when he described to us most adventurous journeys, having valuable results. He has, I think, surpassed himself in perseverance, and in the privations and hardships he has gone through in his recent expedition to the Andes of Argentina. We may look upon this meeting as a memorable one, for those who planned and carried out an expedition are present, the result of which has been the attainment of the greatest height that has ever been certainly reached by any human being.* I will now ask Mr. Fitz Gerald to read us his paper.

After the reading of the paper, the PRESIDENT said: I will now call upon one of the two gentlemen who have ascended the greatest height ever, with certainty, reached upon this Earth. I will ask Mr. Vines to say a few words.

Mr. S. M. VINES: When Mr. Fitz Gerald asked me to continue and finish the ascent of Aconcagua, I felt far more confidence in myself than in rising to speak before you to-night, and really there is little that I can add to the interesting paper which has just been read. I think, however, that Mr. Fitz Gerald has not really put before you the trouble which he took in preparing the way for reaching the summit of Aconcagua. Between our base camp at Inca, which he has told you about, which was situated at 9000 feet, and our camp at 18,700 feet on the slopes of the mountain, from which the final climb was made, we had three distinct camps: at 12,000 feet, and at 14,000 feet, and at 17,000 feet. By amply provisioning these camps, and by the assistance of porterage, we made it possible for the expedition to accustom themselves to the altitudes, and so made the ascent of the mountain feasible. It was very necessary, indeed, to accustom ourselves to the altitudes. There was a certain malady which we all suffered from in the expedition; it is called mountain sickness, but I will call it by a shorter name to-night. The people dwelling in the Andes of Chili and of Argentina call it puna, and I think it is a very good and short word for expressing the malady.

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* Mr. Johnson, the Indian surveyor, was supposed to have reached 23,870 feet, but this is extremely doubtful. Mr. Graham and Emil Boss ascended a peak, which they supposed to be Mount Kabru (24,015 feet), in Sikkim in 1883; but the identity of the peak has aroused a conflict of opinion, and must remain uncertain. About the ascent and height of Aconcagua there is no doubt.

I wish to say that I endorse everything Mr. Fitz Gerald has said on the subject of puna, and I will just add a few words to the very interesting information that has been given to the world by Sir Martin Conway and Mr. Whymper. Since descending from the mountains, we have been frequently asked if we suffered from those terrible bleedings from the nose and mouth and ears, which are always experienced by people who go up to high altitudes. Now, I do not know whether the Fitz Gerald expedition was particularly free from apoplectic tendencies, but certain it was that none of us ever suffered in this way. Perhaps it was due to our mode of training, and the splendid commissariat that was arranged for by Mr. Fitz Gerald. I myself used to train on the heights around Inca, with a watch in one pocket and an aneroid in the other. But no amount of mountain training will help one at certain altitudes from this malady of puna. This is well shown by the fact that, on more than one occasion, as soon as we descended from our camp at 19,000 feet into the valley we became different men. Once Mr. Fitz Gerald and I set out from our high-level camp feeling very ill. We reached the 14,000-feet camp in the valley, and flung ourselves down in the tent utterly exhausted. We were unable to eat. Our one desire was to rest. After resting an hour our appetites returned, and an hour later I proposed to Mr. Fitz Gerald that we should walk down to Inca. He consented. The distance was 20 miles over the very roughest country, and we covered the ground in something less than five hours—clear evidence of the benefit derived from descending to lower altitudes. The effects of puna were very various. We found it affect us with intense headache at night-time. I had a terrible headache the first night I arrived at the 19,000-feet camp; and suffered from very severe pains in the lower limbs, such as I should describe as a sort of "growing pain." We also experienced extreme breathlessness and entire incapacity for doing any work. I remember, the first morning after my arrival at this high camp, Mr. Fitz Gerald set to work to do the cooking, which consisted of making some coffee; we did not want anything more. He told me to go and get the water for the coffee; this consisted of taking a biscuit-tin and filling it with snow and ice. The snow and ice were exactly 10 yards distant from where I stood, near the fire. The guy-ropes of the tent stood in my way. I stepped over one of them with one foot and waited, and then I dragged the other leg after the first, and so on, until I reached the spot. I was ten minutes gone, and when I got back I had just enough snow and ice to wet the bottom of the kettle!

Then again as to how we made the ascent. Some of the papers describe my ascent of Aconcagua as being done on all fours. Now, although I frequently tumbled on to all fours, I did not crawl up like a monkey, as the paragraph seemed to imply. We were always troubled with breathlessness and weariness, and had to rest frequently, so that near the summit of Aconcagua it came to resting every 5 yards, not in height, but in distance. I found that it was useless to sit or lie down to rest. Exhaustion prompted one to throw one's self down flat, but the achings in one's limbs after resting in that way were so severe, that we found it necessary to lean forward on our ice-axes without sitting down at all.

In conclusion, I would like to say that it was only owing to the great forethought of Mr. Fitz Gerald and his fine knowledge of equipment, his carefulness in detail, which did away to a great extent with the hardships—although not entirely, of course—and still more his great unselfishness and generosity in doing all things in his power for the success of those working with him where he himself had failed, that made the ascent of the mountain possible.

The Chairman: I now call on Mr. Lightbody, who has, I believe, conducted the work of ascertaining the height of Aconcagua.

Mr. Lightbody: As regards the survey work of this expedition, I was fortunate in having a chief who is thoroughly alive to the necessity of being well equipped with good instruments, and is himself a very skilful observer. We used two 6-inch transits, a 5-inch, and a smaller 3-inch theodolite, also a sextant, besides many other instruments for determining height by hypsometrical and barometrical results. In measuring the height of Aconcagua, the sextant and 6-inch instruments only were used. You are all aware, no doubt, that for the construction of a railway most careful levels are taken from point to point over the company's property. These were brought from low-water level at Buenos Aires on the Atlantic, and taken right over from one railway to another, until we arrived at Punta de las Vacas. We took a series of levels in the ordinary manner with a 16-inch engineer's level up to a station on our triangulation near to our base camp, whence we had a good view of Aconcagua. From this point we surveyed, making a traverse on what is called the bar-subtense system, and we arrived still further up the Horcones valley close to the foot of Aconcagua. It was here that we made our final observations for ascertaining the height of Aconcagua. So, you see, it was a perfect method of procedure, beginning from the sea-level and avoiding any hypsometrical or barometrical results, which are never quite reliable; they are always more or less approximate. I may mention that the bar-subtense method was recommended to us by Mr. Coles as being the most reliable we could employ in a country so rough. At our various stations along the traverse we took observations on to the summit of Aconcagua, so that we could check one with the other, and ascertain as accurately as possible what the real height was. The mountain has been previously estimated at heights varying from 22,421 feet to as much as 25,000 by such well-known men as Admiral Fitzroy, who went out in the *Beagle* many years ago; also Pissis, whose map is well known; Stelzner and Güssfeldt, who made such a desperate attempt to get to the summit of Aconcagua, and others. There were many difficulties from the strong winds and the accompanying clouds of cutting dust in doing instrumental work; but Mr. Fitzgerald always insisted in verifying work done under these conditions. Owing to the large number of calculations that we have to go through, we have been unable to give to-night our definite height on the hand-map. There may be some slight variations, because a great deal of work has to be done in going through these calculations. We have many note-books full of them, and our work, I may say, has been somewhat interrupted by illness since our return to England. I will conclude these remarks by expressing my feelings of gratitude in having the good fortune to work with such a man as Mr. Fitz Gerald. In times of adversity or of difficulties, his pluck and perseverance were ever to the fore, and the rigid methods he employed in working out all calculations—very monotonous work up there, working out calculations in a wretched camp—and the pains he took to obtain accuracy, will always be a subject of admiration.

The President: I will now call upon Mr. Philip Gosse, who conducted the work connected with the natural history of this expedition. Mr. Philip Gosse has the very great advantage of having a father present who is well known to Englishmen for his great literary attainments. Mr. Gosse has kindly undertaken to speak for his son, who feels the diffidence of youth, and to tell us the results of the young naturalist's researches.

Mr. Edmund Gosse: In kindly calling upon my son, Philip Gosse, you are in the position of the sovereign in Prior's poem, who found that "when he called another, Abra came." My intrusion will, I hope, be excused, since my son is positively too unused to public speaking to face so formidable an assembly as he sees before him. You will have already gathered from the photographs which have been exhibited, that this grim valley of the Andes was likely to be extremely disappointing to a naturalist. It had none of the luxuriance of a tropical country. You have heard, in Mr. Fitz Gerald's fascinating narrative, of a barren land where sand-storms blow all day over a desert of loose shale. There was, in fact, hardly any apparent animal or vegetable life at all. In one of the very entertaining letters which Mr. Fitz Gerald wrote to Mr. Norman, he said that, so far as he could see, there was nothing alive in the neighbourhood, and, since my son arrived in camp every evening with beasts, and birds, and bugs, he could only conclude that he must have brought them over in bottles from England. In spite, however, of this aspect of extreme sterility, life exists even at that height, and it impresses the imagination to realize that a large number of specimens were brought from the upper camp of more than 14,000 feet—that is to say, from an altitude greater than that of the summit of the Aletschhorn.

Mammalia were extremely few. The one animal of importance is the huanaco, or wild llama, a graceful timid creature with no power of protecting itself except by its fleetness. The puma is supposed to be unknown at this elevation, at least so far south; but although the Fitz Gerald expedition did not see a specimen, they had reason to believe, from the reports of the natives, that pumas were seen occasionally in the Horcones valley. My son found a vole (*Phyllotis griseoflavus*), not infrequent at this height, and a specimen which he has deposited in the zoological gardens is the only one which has ever been brought alive to England. Of birds his collections were more abundant, and here he has enjoyed the inestimable advantage of having his specimens named for him, with extreme kindness, by one of the greatest of living ornithologists, Mr. P. L. Sclater, the secretary of the Zoological Society. The points of scientific interest about the birds he found are chiefly these. A great many of the species which he brought home are now first added to the Argentine fauna, having hitherto been believed only to be Chilian. Another important matter was that no specimens of a great many of these species were to be found in any museum brought from anything like so great a height. A very curious point about these is, that they present very much more uniform and more sombre appearance than the specimens of the same species that have hitherto been described. Another matter of some importance was my son's observation of the habits of the animals. Very few people have ever had the opportunity of observing living creatures of any kind at so great a height. As an example, I may mention the family of the *cinclodes*, which are little birds very much like our own water-dippers; of these he brought back several species, all known to science, but hitherto unobserved in life. He has made copious notes of the habits of those birds, their modes of nesting, and various facts of that kind. The principal bird, of course, at those great heights, is a gentleman who awaits us in the next room, and whom I regret not to see on the platform, a condor 10 feet from wing-tip to wing-tip. The condors seem to be the only living things in that desolate valley, floating round the tops of the mountains with a lazy flight, but, the moment anything attracts them, sweeping down with a whirring noise and a pressing curiosity very sinister and intimidating. I am warned to avoid details, but one anecdote of those austere valleys I must tell you. One morning my son, who had been sleeping in the open, woke up and felt something sitting on the brim of his hat; it was a humming-bird, a brilliant little creature, brown, with a dazzling emerald-green breast-plate. As he stirred, it suddenly flew off;

but he remained perfectly still, and the little creature returned and again perched on his hat, preening itself there until it presently flew away again, and after hovering about a little while disappeared.

Of insects he found exceedingly few; it seems as if the extreme height is distressing to them. There are even no parasites on the animals. The mules lost all their fleas, and, what was more extraordinary still, the condors and other birds had none of their customary parasites. Tarantulas there were, and a boisterous fly that made a clicking noise by day and night. Several new scorpions have been brought home, not yet named, but believed to be unknown to science. Some interesting beetles and wasp-like flies have been lost to science through what I can only call an outrage. My son collected these insects, and, finding that there was no methylated spirit left, helped himself to a bottle of whisky and put them in that, while he went out to make fresh captures. I can hardly bear to tell you what occurred next; but it is necessary that this painful incident should be unveiled to you. The remainder of the expedition came in while my son was out of camp, and in the dusk they helped themselves to this bottle of whisky; they drank its entire contents, and those invaluable specimens are lost to science for ever.

I must now, for a moment, speak of the plants. Miserable and barren as the place seemed, my son was able to bring back between sixty and seventy species. These have been named by Mr. Burkill, of Kew. There are no trees in the Horcones valley, nothing larger than a coarse prickly shrub. A few flowers grow in summer by the banks of the streams. The only touch of colour in the landscape is given by large tracts covered, in their season, with nasturtiums of every degree of shade and tone, from palest yellow to deep hues of orange and bronze. Some of the plants he brought back have been hitherto only known by very imperfect and confused specimens; for example, the interesting genus of *Senecio*, which Sir William Hooker arranged in 1841, will be re-arranged and re-described from the specimens of many species brought home by this expedition; some interesting algæ, too, were brought from the high ponds. This is a slight outline of what my son, himself an absolute novice, on his first occasion of zoological and botanical travel, has been able to bring back. I cannot sit down without asking your permission to express, in this public way, my warm sense of indebtedness to my friend Mr. Fitz Gerald for his kindness, the more than fraternal care which he took of my son, and for the faith with which he accepted so young a naturalist on the strength of his first enthusiasm. It is impossible for me to overestimate the extreme kindness with which Mr. Fitz Gerald encouraged my son, and guarded him through all the adventures and dangers that you have heard of.

The PRESIDENT: That portion of the mountain of Aconcagua which is in this country has been entrusted to Prof. Bonney, and he has kindly promised to address a few words to us on the subject this evening.

Prof. BONNEY: You might suppose that expeditions of this kind could not add very considerably to our geological collections; nevertheless, Mr. FitzGerald and Mr. Vines have brought back about thirty specimens from Aconcagua and Tupungato. From Aconcagua, the lowest rock they have brought was a reddish limestone, with some impressions of ammonites, showing that these belong to the sedimentary rocks which make the foundation stones of the Andes. After that they obtained some gypsum in a valley under the mountain, and then passed in the ascent over a series of volcanic rocks. It is not necessary for me to go into details, but I will merely say that one very remarkable piece of rock was picked up at a height of 21,800 feet. All the rest of the rock, so far as the specimens show, is very much of the same character. This, however, Mr. Vines says, was quite different from that in the neighbourhood. It is a small piece of dark rock, which under the microscope proves to be wholly crystalline, and consists mainly of hornblende. That rock must have been ejected from some very great depth in the Earth; it has nothing to do with the lava and scoria of which a volcano is formed. The actual summit of Aconcagua is hornblende-andesite. On Tupungato they found at the 11,000-feet camp a rock which has a higher percentage of silica than the aforenamed. After that they got very nearly the same rocks on Tupungato as they did upon Aconcagua, only on it there was a larger amount of volcanic scoria. The summit rock is perfectly riddled by fulgurites—those curious tubes lined with glass and made by lightning. Two points are of general interest: the first, that in all the upper parts of these two mountains, 50 miles apart, almost identical rocks occur; and, more than that, these rocks bear a very strong likeness to those brought back by Mr. Whymper from the equatorial Andes. The second point is this, that, while both these great peaks are volcanic, the craters have wholly disappeared. From Aconcagua itself no scoriaceous specimens were brought back, and this fact, combined with the enormous precipices on the eastern side, would lead me to suppose that beds of lava enter very largely into the composition of that peak. The present summit is either a dyke in the wall of the old crater, or else the actual lava-plug which has choked up the bottom of it. Consequently the whole of the crater has gone, and that which was the lowest part is now the highest. So that we may fairly assume that one or more thousand feet once rose above the present top of Aconcagua. The crater has also gone from Tupungato, but on its top there is very much more scoria; so that probably more ruins of it are left here than on Aconcagua itself. The rocks from other peaks I have not yet had time to examine; and, in speaking, I have strictly confined myself to business, for if I were to begin to express my admiration of the pluck and perseverance shown in these ascents, I should keep you here, I am afraid, till rather a late hour.

The CHAIRMAN: Perhaps Mr. Douglas Freshfield will say a few words to us.

Mr. FRESHFIELD: I had no intention of addressing the meeting this evening, but your commands here are always law, and I should be very sorry to appear in the least degree backward in tendering my congratulations to Mr. Fitz Gerald and his companions, particularly to Mr. Vines, who, with very little mountaineering experience beforehand, succeeded in getting to the height he attained, which is certainly one of the greatest heights that has ever been reached. It is a curious coincidence, and I cannot help noticing it, that while we are here to-night to listen to the story of the first ascent of the highest point on the American continent, some of us will meet to-morrow night at the Alpine Club to celebrate the first ascent of the mountain that has until lately (when it has had to yield to its neighbour, Mount Logan) been considered the highest in North America—Mount St. Elias. To-morrow Dr. Filippi will give his description of the ascent of that great mountain by an expedition led by H.R.H. the Duke of the Abruzzi, the nephew of the King of Italy. Last year was a singularly notable one in the exploration of mountains in America. At the time your delegates were being fêted on the Canadian Pacific railway, some of the members of the Alpine Club, a few miles further north, were discovering unknown glaciers and verifying the existence of the great mountains, Mount Brown and Mount Hooker, which were first seen by Canadian surveyors years ago, but whose altitude had been called in question. When a feat has once been accomplished, it is apt to become comparatively easy. But we must remember that in both these cases of Mount St. Elias and Aconcagua there had been attempts which were not successful. Dr. Güssfeldt was an accomplished mountaineer, and yet he failed on Aconcagua, and we must regret his absence to-night when he would have been the first to tender his congratulations to the English expedition which was able to carry to completion the task he left unfinished.

I might be drawn by Mr. Fitz Gerald's paper into the discussion of other topics. The effects of low pressures, of the "rarity of the air" on the human frame, the greatest heights respectively reached by various climbers on mountains—these are more or less open questions, which it would take some time to discuss satisfactorily. But they are, I think, more suitable for discussion before a body such as the Alpine Club than before a Society whose aims are more general, and which has not on its Council at the present moment any one qualified to express an expert opinion. I will therefore conclude by repeating what I am sure is the feeling of every one here, and more especially of all mountain travellers, who know how much care and forethought are needful to organize such an expedition, as well as how much endurance in the actual work of climbing, that our best thanks are due for what has been done by Mr. Fitz Gerald and his companions in conquering Aconcagua, and bringing home so complete and vivid a description of the district in which it is situated.*

Sir MARTIN CONWAY: At this late hour I will content myself with taking the opportunity that you have been good enough to give me to congratulate Mr. Fitz Gerald and every member of his party on the admirable results attained by their most important and interesting expedition. There are many points that would be interesting to discuss if there were time to discuss them. Particularly interesting is Mr. Vines' account of the effects of high altitude upon the human frame as observed in the different members of that expedition. In the main they are similar to, almost exactly the same as, those that I and the members of my expedition experienced in the Himalayas at corresponding altitudes. I think that every expedition that goes out to high mountains—mountains above 20,000 feet—and comes back again, brings, or has brought, with one single exception, accounts of exactly the same kind of experiences that the members of this expedition have recorded at high levels. There is a single exception, and one only so far as I know, that of the Himalayan expedition of Mr. Graham. His observations are at variance in all respects with the observations of all other mountaineers whatever. That is an important matter, too long to go into to-night; but when talking of high ascents, it has to be borne in mind, because Mr. Graham claimed to have climbed to an altitude of about 23,700 feet, which would undoubtedly be the highest ascent ever made. All mountaineers have that ascent in their minds when they discuss this question of the highest level that has been reached by climbers. At all events, whether that ascent was actually made or not—and I for one do not believe that an ascent to that altitude was made at the time and in the place in question—but whether it was made or not, we have Mr. Fitz Gerald and Mr. Vines here safely returned from some ascents of a very big and interesting kind. There is one point in connection with these ascents which I perhaps am peculiarly able to appreciate and emphasize. Aconcagua is about 23,080 feet high. My own ascent was of a mountain which was barometrically measured at 22,600 feet, and trigonometrically measured at 23,000 feet. At all events it was within 200 or 300 feet of Aconcagua. Now, our experiences were similar to Mr. Fitz Gerald's and Mr. Vines' in many respects, but we did not have to face the howling gales which raged about Aconcagua. Mr. Fitz Gerald and his party were really quite exceptionally tried, I conceive, by the violent gales of wind they had to face daily. If there had been no movement in the air whatever, they would have been tried in another way, for few things are more painful than absolutely still air at great heights, as Mr. Vines noticed in the sheltered couloir on Aconcagua. But between a gently moving breeze, which is what you want, and these raging gales, which blow men and animals down flat, there is considerable difference. When you remember that the ascents we have just heard described were made in that kind of weather, I think you must look upon Mr. Fitz Gerald and his party as having acquitted themselves right well. I am sure I congratulate them with all my heart on the success they have attained.

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* Mr. D. Freshfield desires to refer those interested in the questions alluded to in his remarks to an article contributed by him to the number of the *Alpine Journal* for February, 1898, No. 139, "The Highest Climbs on Record."

The PRESIDENT: I should be sorry to say how many years ago it is since I first made the acquaintance of Aconcagua. I used to gaze upon it for many days, both from Valparaiso and from heights above Quillota. I can only claim a slight bowing acquaintance with that great peak, and I never attained to that intimacy which it has been the destiny of Mr. Fitz Gerald and his companions to acquire. I congratulate them on the excellence of their topographical work in connection with Aconcagua and the other mountains near it, and I think, when we contemplated and listened with interest to the work that has been done by them, we should have remembered that this is only a very small part of the unknown region of the Andes. Hundreds and hundreds of miles of these mountains are unknown. It is too soon yet to say whether Aconcagua is the highest peak in the Andes, for many lofty peaks, said to be over 20,000 feet in height, have never been measured; they have never been visited, have never been approached by any one who was capable of describing them. Special interest attaches to the exploration of these Andean ranges, because they all have associations connected with them—legends and stories from the time of the Incas, or from that of the Spaniards. For a particular purpose, I will allude to one memorable incident which happened within sight of Aconcagua. There a march was made, a military achievement was performed far superior to that of the passage of the Great St. Bernard by Napoleon, and comparable with the passage of Hannibal over the Alps. In 1817 General San Martin, in order to achieve the liberation of Chile, crossed the pass of Los Patos within sight of Aconcagua. He had to think of many things. First the grand conception of doing it at all, then all the details connected with the commissariat had to be provided for. He took five thousand men, with artillery, materials for making bridges, and provisions, safely across that pass, fought the battle of Chacabuco within three days afterwards, and entered the capital of Chile within five days. Now, that was a great achievement. He did not forget anything. He did not forget that sickness which has been alluded to by Mr. Freshfield and Sir Martin Conway; he provided for that also. The natives now, I know, call it puna, but the name of the disease is *sarochi*. I have been in the Andes up to 17,000 feet, and often to 12,000 feet and 16,000 feet, and I never suffered from it myself except on one occasion, but my mules did, and I used San Martin's remedy, which did them a great deal of good. I do not know whether the way San Martin and his people cured their mules was also applicable to the soldiers and the camp-followers. It was by rubbing their noses with garlic or onions, and the general took several mule-loads of garlic with him. I have alluded to this great achievement of San Martin because I consider that the work of Mr. Fitz Gerald is comparable to it. For a great explorer must have all the qualities of a great general. Like General San Martin, Mr. Fitz Gerald had first to conceive his great enterprise, then he had to consider all the details connected with it, then he had to select his companions and to train them; and if he was to succeed, as he has succeeded, he had to show those higher qualities of sympathy, of care for their welfare and comfort, which he has shown, and which have been testified to by his companions to-night. He also had to show that extraordinary pluck and indomitable perseverance in the face of the most miserable life that could possibly be imagined, which enabled him to get through the work and to accomplish all that he has done. I am quite sure that this meeting will pass a vote of thanks to him by acclamation, and I hope you will join with the name of Mr. Fitz Gerald those of his companions—Mr. Vines, Mr. Lightbody, and Mr. Gosse.

THE GERMAN DEEP-SEA EXPEDITION.

Last year Prof. Chun, of Leipzig, laid before the "Gesellschaft deutscher Naturforscher und Aerzte" (corresponding to the British Association for the Advancement of Science) a plan for a German scientific deep-sea expedition. The proposal was well received, and a resolution approving of the plan, and recommending it to the favourable consideration of the Government, was unanimously adopted on September 24, 1897. As originally conceived, the expedition was intended to be exclusively zoological, after the manner of the Plankton Expedition, but Prof. Ratzel, of Leipzig, suggested that chemical and physical observations should be included in the work of any such deep-sea expedition as Prof. Chun had in view—a suggestion which has been acted upon. The German Government favoured the proposal, and during last winter the Parliament voted a sum of 300,000 marks towards the cost of the expedition; additional grants will be made to cover the expenses of the expedition and the expense of publishing the scientific results.

The vessel chartered for the purposes of the expedition is the steamship *Valdivia*, belonging to the Hamburg-American Line of steamers, of 2600 tons, 320 feet in length, 43 feet in width, and of 1250 horse-power. The directors of the Hamburg-American Company have entered into a contract with the Secretary of State for the Interior, with no desire to make a profit out of the transaction, but rather with a desire to encourage scientific investigation. This contract provides for the use of the ship and ship's company, provisioning of the members of the scientific staff (wine to be supplied at cost price), erection of a deck-house for microscopic work (to be fitted up in accordance with the wishes of the leader of the expedition), fitting up of a room between decks as a chemical laboratory lighted from the roof and supplied with electric light, fitting up of a dark room for photographic work, fitting up of other apparatus and machinery, and generally to fit the ship for the special objects in view, all for a slump sum of 340,000 marks.

The German Deep-Sea Expedition of 1898 has started under the most favourable auspices as regards the vessel itself, the arrangements made to adapt it for carrying on deep-sea investigations, and for the accommodation of the members of the scientific staff, and the apparatus and appliances to be used in carrying on the work, which are of the latest and most approved description. The *Valdivia* is about the same size as H.M.S. *Challenger*; she steams 10 to 11 knots; the bacteriological, chemical, and biological laboratories and workrooms are commodious and well fitted up; the cabins occupied by the scientific staff are large and handsome, the principal cabin containing a splendid scientific library, including a complete set of the '*Challenger* Reports;' and there is ample accommodation for storing the marine and other collections made throughout the cruise.

The *Valdivia* sails under the command of Captain Adalbert Krech, who has been a whaling captain, and has been in the Rumanian-Turkish Services. In 1874 he saved at sea the crew of the American ship *Mary E. Emsten*, and received a gold medal from the Emperor, a gold cup from President Cleveland, and decorations from the Kings of Saxony and Rumania and the Sultan. Since 1882 he has been in the service of the Hamburg-American Line. Captain Krech has with him on board the *Valdivia* eight officers and engineers, most of whom have previously served under him, and a crew of thirty-five men.

Prof. Carl Chun, professor of zoology in the University of Leipzig, the originator and leader of the expedition, is accompanied by a staff of eleven scientific men, to assist him in carrying on the various observations, as shown in the following complete list of the members of the expedition:—

A. *Official members*—
  Prof. Carl Chun, leader.
  Prof. W. Schimper (Bonn), botanist.
  Dr. Karl Apstein (Kiel), zoologist.
  Dr. Ernst Vanhöffen (Kiel), zoologist.
  Dr. Fritz Braem (Breslau), zoologist.
  Dr. Gerhard Schott (Hamburg Seewarte), oceanographer.
  Dr. Paul F. Schmidt (Leipzig), chemist.
  Officer Sachse (Hamburg-American Line), navigator.
  Dr. M. Bachmann (Breslau), physician and bacteriologist.

B. *Non-official members*—
  Dr. August Brauer (Marburg), zoologist.
  Dr. Otto L. zur Strassen (Leipzig), zoologist.
  Herr Fr. Winter (Frankfort a/M.), scientific draughtsman and photographer.

Each member of the scientific staff receives eight marks per day from the Government, and their lives are insured for 30,000 marks each in case of death.

The *Valdivia* sailed from Hamburg on August 1st last, and is expected to be absent about nine months. The route to be followed may be divided into three portions: (1) From Hamburg round the north of Scotland to the Canary islands, past the Cape Verde islands, touching at the mouths of the Kameruns and Congo rivers and Walfisch bay, to Cape Town; (2) from the Cape of Good Hope, the Agulhas bank will be examined, then southwards past Prince Edward island to the edge of the antarctic ice, returning northwards through the centre of the Indian Ocean to the Cocos and Christmas islands, and thence to Padang in Sumatra; (3) from Padang to Ceylon, thence calling at the Chagos, Seychelles, and Amirante groups of islands to Zanzibar, returning home by way of Sokotra, the Red sea, Suez canal, and the Mediterranean.

The expedition was accompanied from Hamburg to Cuxhaven by Staats-Sekretär von Posadowsky; the Burgomaster of Hamburg; the directors of the Hamburg-American Line; Prof. Neumayer, director of the Deutsche Seewarte; and many other scientific men; complimentary speeches, with good wishes for the success of the expedition, being delivered by the Home Secretary, the chairman of the directors of the Hamburg-American Line, and others. Leaving Cuxhaven at 8 p.m. on the evening of August 1st, the ship crossed the North sea to the Firth of Forth, preliminary trials with the dredging and other appliances being made on the way with signal success.

The *Valdivia* anchored off Granton on the evening of the 3rd, with the object of receiving on board additional scientific apparatus, and of landing Dr. Erich von Drygalski (who has been nominated to act as scientific leader of the German Antarctic Expedition of 1900), Dr. Georg Pfeffer (keeper of the zoological department of the Hamburg Museum), and Sir John Murray of the *Challenger*, who had accompanied the expedition from Hamburg. On August 4th, all the members of the expedition visited the *Challenger* Office in Edinburgh, and examined the specimens of deep-sea deposits, etc., brought home by the *Challenger*. In the evening, after being entertained to dinner by Sir John Murray, the expedition sailed for the Faroe channel and the Canary islands, being accompanied as far as the latter place by Geheimrath Dr. Mikulicz, professor of surgery in Breslau.

Preliminary accounts of the first dredgings, trawlings, and temperature observations in the North Atlantic have been received, the expedition having safely arrived at the Cape Verde islands. The expedition is now engaged in explorations off the west coast of Africa, and is expected to arrive in Cape Town in November.

DR. THORODDSEN'S EXPLORATION IN ICELAND, 1898.

Dr. Thoroddsen has sent us the following statement with reference to his work in Iceland during the past summer:—

"This summer (1898) I have finished my geographical and geological researches in Iceland, which were commenced in 1881, and I have succeeded in examining the whole country. This summer I investigated the interior highland north-west of Langjökull and the mountain region behind the valleys of Borgarfjord. The weather was rough and cold, with much rain; but as fogs were rare, the researches could be carried on without serious hindrance. The large lava-field Hallmundarhraun, which hitherto has been but slightly known, was first examined; it was found to proceed from a series of craters bordering Langjökull. The north-western margin of the rocks of Langjökull is split by long crevices, and has terrace-like slopes. In one of these crevices we see the range of craters, but out of other fissures, older streams of lava have been ejected before the terrace-forming subsidences took place. The lava is very uneven, containing many fissures and cavities. Eiriksjökull and the Langjökull snowfields, like other snowfields in inner Iceland, rest upon large breccia tablelands which rise above the principal highland. These fragments of tableland, we suppose, were originally connected, forming a 3000-feet-thick layer of breccia, which covered the whole surface of inner Iceland, and which subsequently was cut asunder by erosion and carried away, leaving behind detached remnants. The strata underlying the breccia is everywhere tertiary basalt. Five very steep glaciers with large moraines descend from Eiriksjökull; three of them were hitherto unknown. On the western side of Langjökull nine new glaciers were found, two of which are very large. The highland north-west of Langjökull (Storisandur and Arnarvatnsheids) consists of mighty pre-glacial lava-currents, with distinct scratchings and a number of large erratic blocks on the surface. On the plateaux more to the west (Tvidogra) the firm rock seldom projects. Here we find an abundance of mighty moraines; the depressions contain bogs, with innumerable large and small lakes, most of which are shallow. The map is defective in this place, so that considerable measurements had to be taken in order to determine the relative situation of this multitude of lakes. On Tvidogra the tableland is comparatively low, about 1500 feet above sea-level. The vegetation is copious, and serves as pasture for large herds of sheep from the settlements of the northern and the southern country; the lakes are full of trout, and the bird-fauna is very rich.

"After having sojourned a considerable time on these high tablelands, examining their physical geography and geology, I went, in the beginning of August, to the mountain regions behind the valleys of the Borgarfjord. Here we erected our tents in different places 2000–3000 feet above the sea, made pretty long excursions, and climbed several rocks. The glaciers of the south-western angle of Langjökull were investigated, as well as older and more recent glacial formations. The weather as a rule was cold, in the afternoon seldom more than 37° to 40° Fahr. inside the tent, and 34° to 36° outside, with frequent frost at night. The pre-glacial volcano Ok, 3800 feet high, was examined. Hitherto it was thought that the pre-glacial lava-streams extending down to Begkjanes and to the neighbourhood of Begkjavik, proceeded from this mountain; but this summer's investigation proved that the pre-glacial lava about Begkjavik comes from a place of eruption on Mosfellsheidi, and not from Ok. The latter mountain, however, had also ejected much lava before the ice-period, and lava-currents have flowed thence through the valleys down to the low country; such a pre-glacial stream appears distinctly, *e.g.*, in Flókadalur. The valleys here prove to be of much more ancient date than the ice-period. The mountains behind the Borgarfjord consist at the bottom of basalt, but in their upper parts of tufa and breccia. Hereabouts are several interesting deep lakes, as, for example, Beydarvatn and Hvalvatn, which seem to have been formed by glaciers during the ice-period. The lake-basins seem to be tertiary; afterwards the cavities may have been filled up with tufa and breccia, and these rocky substances eroded and carried away by the glaciers.

"At the end of my journey I made several excursions to volcanoes on the Begkjanes peninsula, in order to examine various volcanic crevices and craters."

PEARY'S 'NORTHWARD OVER THE GREAT ICE.'[*]

Lieut. Peary has personally presented to the Society a concise account of his arctic work, which is published in the *Journal*, vol. xi. p. 213. There could be no better epitome than that paper of the work now published in two handsome volumes very rich in illustrations—not less than eight hundred photographs—but only poorly supplied with maps. No doubt a new map of Smith sound is being prepared, for Mr. Peary, with his opportunities of sledging and boat-journeys along the coast, has been able to make very considerable corrections on the existing charts. The book is avowedly popular; the results of the very laborious scientific observations of many kinds, which were constantly made, have still to be worked up by specialists, and will appear as separate monographs. Still, the meteorological data are published in some detail, and there is also a fair account of the ethnology of the Smith sound tribe, with a complete census of all the inhabitants by name.

The illustrative photographs are very interesting, especially those of the people, which are unique. During the long darkness of the winter night, a great deal of work was done in photographing types of the natives by flash-light, and these pictures show a surprising development of physique. Much of the interest of the book necessarily lies in the description of the people and their ways. The account of their house-building is particularly instructive. The clean-cut, symmetrical beehives of transparent ice with which one associates the

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[*] 'Northward over the Great Ice: a narrative of life and work along the shores and upon the interior ice-cap of Northern Greenland in the years 1886 and 1891–97, with a description of the little tribe of Smith Sound Eskimos, the most northerly human beings in the world, and an account of the discovery and bringing home of the "Saviksue," or great Cape York meteorites.' By Robert E. Peary, Civil Engineer U.S.N. In two volumes. London: Methuen & Co. 1898.

Eskimo do not appear to be erected by these people, who live in *tupiks* (tents or huts of skin) in summer, and in *igloos*, partly excavated, partly stone-built dwellings, in winter. The winter igloos seem to be appropriated by any family which fancies them for the time, and are not private property. There are some interesting reproductions of native drawings, showing considerable skill, and a couple of native maps of the coast-line, drawn offhand to show the position and succession of the capes and bays.

Although Mr. Peary, in his anxiety to avoid the introduction of "padding," says very little indeed of the work of previous arctic travellers, and expressly excludes "the stock chapter on equipment," he lets drop many valuable hints on the latter subject. He is a believer in furs as the only practicable material for arctic clothing, and only tolerates woollen underclothing. With proper furs, he never felt cold even with the thermometer at −60° Fahr., and a strong wind blowing. He slept in the open air, and without a sleeping-bag latterly, contenting himself with the erection of a snow wall to keep off the wind.

The introduction contains a full account of the way in which the expenses of the various expeditions were met. It is not too much to say that the whole of the money was raised by the individual efforts of Mr. and Mrs. Peary, by their books, lectures, the conveyance of independent scientific parties in their chartered ships, and by inducing a few societies and a few individuals to contribute small sums. There was no government assistance or encouragement. Each year it was harder for Lieut. Peary to extort an extension of leave from the Navy department. For determined and persevering effort in the face of difficulties and disappointments, this series of explorations has had few equals. The story of the whole work is admirably told, with a wonderful command of language and descriptive force, but always in a modest way, making the least of trouble and danger and the most of the help rendered by companions and natives alike.

In the arrangement of the book, the excellent plan is followed of supplementing the narrative of each expedition by a note of the objects with which it was undertaken, and a summary of the results obtained; so that the essential facts are not lost in the multiplicity of details which makes up the narrative.

The introduction concludes with some words on the utility of polar exploration that are worthy of being remembered—

"Were I asked to enumerate all the possible advantages of arctic explorations, I should say frankly I cannot do so, any more than I or any one else could have said, fifteen or twenty years ago, that an insignificant grass growing on the banks of a tropical river would make our incandescent electric light a possibility. It would not be at all strange if, in a region of the strangest contrasts, where active volcanoes are found surrounded by eternal snow and ice, and where the poppy—

symbol of warmth and sleep and luxury—blossoms at the very foot of the crags of icy glaciers, some materials were found which would make possible some yet unknown necessity of our future civilization.

"But suppose we admit that arctic exploration is only a matter of sentiment, with no money return, no increase of commerce, no fruit of colonization, no harvest of great good for many men. Let it stand as a sentiment; it has good company. Love and patriotism and religion are matters of sentiment, and we ask no money return for them."

THE RESOURCES AND MEANS OF COMMUNICATION OF CHINA.*

By GEO. G. CHISHOLM, M.A., B.Sc.

"We are on the eve," says Mr. Colquhoun, "of an industrial development in China which will revolutionize the world."† It is many years since such a revolution has been anticipated as destined to come about sooner or later by many of those acquainted with the resources of China, though it is only quite recently that that country has come to engage the attention of all the world. What the precise nature of the economic changes likely to ensue on the complete opening up of China may be, it is impossible to foretell. They are sure to be complex, but they are sure to be great. Looking at the future dispassionately, and laying aside all national bias, one may say that the process of evolution likely to go on within the next generation, through the application of modern methods of production and transport in China, may be expected to be as interesting as any that has taken place in history since the discovery of the seaway to India, or, at least, since the introduction of steam-driven machinery into Europe. The present time, therefore, is opportune for considering the facts, and with that view the present article and the accompanying map have been prepared.

Density of Population.

That the indications on this head furnished by the map can be taken only as rough approximations hardly needs to be mentioned. The data on which such indications must be based are altogether too uncertain to make it worth while, or even reasonable, to enter into nice calculations. I will merely state, therefore, that the figures on which the indications on the map are founded are those contained in the eighth number of the *Bevölkerung der Erde* (Gotha, 1891), p. 105, where the total population of China proper, excluding Manchuria, but including at that time Formosa (to which a population of 3,000,000 is ascribed), is taken at 350,000,000 in round numbers.‡ The grounds on which this total and its distribution among the several provinces are based are set forth in the pages preceding the table referred to.

Whatever may be the truth as to the absolute numbers of the population of China, there can be little doubt that the different tints on the map at p. 552 give at least a fair indication of the differences in density of population of different regions. Having for the most part only provincial estimates to depend on, I have generally made the boundaries of the provinces the limits of the tints for density of population; but in some cases I have departed from this rule in order to take account of known facts with respect to the relative aggregation of population. Obviously another element of guesswork with reference to actual numbers is thus introduced, but it seemed to me, nevertheless, better to face that necessity than to ignore facts of significance to which it is important to draw attention.

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* Map and Sections, p. 552.

† 'China in Transformation,' p. 152.

‡ For a much lower estimate (282,000,000), and the reasons on which it is based, see a paper by Sir Richard Temple, in the *Jour. Stat. Soc.*, vol. xlviii. pp. 1–20.

PRODUCTS AND MINERAL RESOURCES.

The names of the vegetable and animal products of China written on the map will, of course, not be understood to include all the important products of the kind. They are written only where they are locally characteristic, and hence some of the most important are omitted, because universally distributed or extending over too wide an area to be indicated as belonging to any particular localities.

The mineral resources of China are well known to be enormous, and if we look to the future, the most important of these is, beyond all question, coal. On the map, I have indicated, in accordance with Richthofen's map opposite p. 754 of vol. ii. of his work on China, the areas in the north-east of China where coal-bearing strata are believed to occur either superficially or beneath the surface. For the remainder of China, I know of no such data, and for large areas we are still altogether without information. I have shown also, on the strength of various authorities, the situation of the chief localities in which coal is actually mined, or seems to be most promising for mining industry in the near future.

Two coal-bearing regions in China stand out above all others—eastern Shansi in the north, and southern Hunan in the south. The anthracite field of the broken plateau of eastern Shansi is probably the most remarkable coalfield in the world. I have given elsewhere * a somewhat detailed account of this field from Richthofen's description of it.† Here there is only space to say that it is a continuous field of about 13,500 miles in area, composed of fuel equal to the best Pennsylvanian anthracite, with seams up to 40 feet, and everywhere one of at least 15 to 20 feet in thickness, and in many places workable by means of level adits. The western half of the same province (west of the Ho-shan range) is nearly as rich in bituminous coal as the eastern half is in anthracite, and there is an important detached and depressed outlier of the anthracite field, only about 150 feet above the plain, in the neighbourhood of Hwaiking-fu, north-east of Honan, in the portion of the province of that name lying north of the Hwang-ho. Few mines, according to Richthofen,‡ are better situated than these last for the application of steam-power.

"The whole of south-eastern Hunan," says Richthofen, "may not unjustly be called one great coalfield." § The extent of this field he estimates at 21,700 square miles, but more than half of that area he states to be covered by sedimentary deposits of many thousand feet in thickness. The mines being, as shown on the map, in a convenient situation for water-carriage, some in the valley of the Siang, above Siangtan, others in that of the Lei, or, as Richthofen calls it, the Lui, the production is already considerable. The Siang mines yield only a semi-bituminous coal of extremely poor quality, but the Lei valley mines yield mainly anthracite,

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* *Jour. Stat. Soc.*, vol. liii. (1890), pp. 585–586.

† 'China,' vol. ii. pp. 435, 439–440, 471. Letter III., pp. 14–16. (Throughout I have referred in this way to the seven letters written by Richthofen to the Shanghai Chamber of Commerce about twenty-eight to thirty years ago.)

‡ 'China,' ii. pp. 401, 402.

§ Letter I., p. 5.

some poor, some excellent.* In the Lei valley Richthofen believed that nothing but anthracite was produced, but Morrison found bituminous mines there also.†

Coal is also mined in the west of the province, in the departments of Shinchau-fu and Yuenchau-fu, but Richthofen was unable to learn the precise localities of production.

Sze-chuen may also be included among the provinces extremely rich in coal, though I have been able to get little information with regard to the exact spots in which it is mined. "Coalfields," says Mrs. Bishop, "appear to underlie the whole surface of Central and Northern Sze-chuen."‡ Coal is also largely mined. On the Kialing river, Mrs. Bishop tells us, the coal traffic is enormous. At several points she saw coal-yards fully an acre in extent, stacked to a height of 8 feet with coal in large blocks.

Among the mines of Pechili, those of Kaiping are interesting as the first in China worked under European management and by European methods, and the first to be connected with a port by rail. Those of Fangshan-hsien, about 35 miles south-west of Peking, are the mines that supply the capital with its fuel (a tolerably good anthracite), which is conveyed by means of the Liuli-ho and other streams.

With reference to the occurrence of coal in Kansu and other parts of northern China, it may be noted here that at no distant date it is likely to derive increased importance from the great supplies of wool obtainable in this region. At present woollen clothing is little used in China. Furs and padded cotton garments are the only means of warding off the severity of the winter cold. But it can hardly be doubted that woollen clothing would form a convenient and favourite wear if it could be procured cheap enough. That this is already perceived by the Chinese themselves was shown in an interesting manner by the experiment of Tsotsungtang, the governor of Shensi and Kansu, who succeeded in suppressing the Mohammedan rebellion in the north-west. A woollen factory was started by him at Lanchau-fu, at first with machinery of his own contriving,§ and when this, naturally enough, did not succeed, was equipped with the best European machinery. This failed too, but its failure, according to Rockhill, was due to carelessness and rascality ‖ (whose he does not say), and the attempt may be taken, nevertheless, as an indication of what the future is likely to bring forth.

Of the coalfields of Shantung, that of Poshan, east by south of Tsinan-fu, is at present the most productive; but that of Changkiu-hsien further west, though more expensive to work by Chinese methods, is believed by Richthofen to be really the most important of all in the province, and that of Ichou-fu and I-hsien, the most southerly coalfield of the province, is also regarded by him as possessing all the requirements for playing a great *rôle* in the future.

In addition to coal, iron ores are widely diffused in China, but at present only those ores which can be most easily smelted by native methods are made use of. Such ores exist in great abundance throughout the anthracite field of Shansi, where an important iron industry has long existed, and is likely to grow into much vaster proportions hereafter. On the map are indicated two districts, one in the north and one in the south, where the ores are already largely worked. The southern iron mining and working district is what is known as Fengtai, the chief town and centre of the industry being Tsechau, though the wares produced are generally known, and have been known for more than two hundred years, as Lu iron, from the town of Lungan-fu further north, which is the chief centre of distribution. The chief iron mining and smelting centres in the north are Loping, to the south of Pingting-chau, where a very pure brown hematite mixed with spathic iron ore is found; and Yi-hsien, to the north of Pingting-chau—this town, standing on the main road connecting the eastern plain with the interior of Shansi, being an important centre of the iron industry, using both the raw iron of Yi-hsien and the wrought iron of Loping.

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* G. J. Morrison in *Proc. R.G.S.*, 1880, p. 160. † Ibid., p. 161.

‡ *Geo. Jour.*, vol. x. p. 21.

§ See Michaelis, 'Reise von Hankou nach Sutschou,' Ergänzungsheft, No. 91, to *Petermanns Mitteilungen*, p. 31, col. 1.

‖ 'Land of the Lamas,' p. 36.

In the coal-producing region of Hunan, on the other hand, iron ores are only sparsely distributed; but two places are mentioned by Morrison as producing ore which is locally smelted. Both of these I have shown on the map, one to the south-east of Heng-chau, and the other near Chen-chau.

The fact of coal and iron being found near one another has also developed an iron industry in Manchuria, at Liauyang, to the south-west of Mukden, at Saimaki, near the Korean frontier, and above all at Pen-hsihu, to the south-east of Mukden, coal occurring in abundance at that place, while excellent magnetic iron ore is mined to the south.

With regard to most of the other minerals of importance, the map must be left to speak for itself; but it may be mentioned that the copper mining for which Yunnan has long been famous was greatly injured during the Mohammedan rebellion, some of the chief mines having been flooded then, and not since worked.

The tin-mines of Yunnan are confined to an area of about 10 square miles in extent among the mountains a few miles to the west of the city of Mengtse or Mongtse, the treaty port, or rather imperial customs station, in the neighbourhood of the Red River, opened under the second article of the *Convention additionelle* signed between China and France on June 26, 1887. The chief mining centre is Kochiu, or Kiochiu, about 10 to 15 miles west of Mengtse. Besides tin, silver, lead, and iron occur in the district, but tin-mining has always been of most consequence there.

MEANS AND COST OF TRANSPORT.

From what has been stated above, especially as to the mineral resources of China, it will be tolerably evident that China possesses enormous stores of wealth, the value of which depends upon adequate means of communication and transport. Now, the fact is, that except where there is easy communication by water, the cost of transport in China, notwithstanding the extraordinary cheapness of labour, is exceptionally high, and it is probable that even on the better class of waterways the cost of carriage might be considerably if not very greatly reduced.

A few data in illustration or enforcement of these propositions will probably be found of interest. According to Richthofen, the cost of transport by land in China, whether by carts, animals, wheelbarrows, or men, may safely be put at 3⅓ to 3⅔ cash per li per picul.* This works out to about 7·2*d.* per ton per mile, the li being taken at Richthofen's usual rate, 3 li = 1 geographical mile (60 to 1°), and the tael (1600 cash) at 6*s.* 4*d.*, which was about the value when Richthofen wrote. The picul is 133⅓ lbs., or 16·62 piculs = 1 ton. In western China, according to Mr. Colquhoun, the cost of carriage for heavy goods, such as salt and pressed cotton, is on an average 1*s.* per ton per mile.†

There are parts of China where the cost of land carriage is lower. In Yunnan, generally, the cost of carriage by caravan is estimated by F. S. A. Bourne at about 2½*d.* per ton per mile.* But that seems to be exceptional, and may be due to the extreme poverty of the province. According to the data furnished by Richthofen † and Baber,‡ the rate paid to the tea-carriers from Yachau to Tachien-lu would amount to 1*s.* 3*d.* per ton per mile, the average load being taken at 224 lbs., or 10 "theoretical catties;" according to those furnished by Rockhill, it amounts to about 8*d.* per ton per mile.§ That, however, is a route of exceptional difficulty. A more striking case is that furnished by Markham ‖ as to the cost of carriage of coal to Wei-hsien, in the province of Shantung, from the mines 7 miles distant (the north-eastern coalfield of the province). It amounts, he says, to from 8*d.* to 10*d.* per picul, or 11*s.* to 13*s.* 10*d.* per ton, or from 1*s.* 7*d.* to 2*s.* per ton per mile. The carriage is effected by means of carts, wheelbarrows, and donkeys. Richthofen states that at the time of his visit anthracite, which cost at Pingting-chau 1*s.* 4*d.* a ton,¶ cost at Hwolu-hsien, at the entrance to the plain, after being carried 80 miles on the backs of asses, 68*s.*, an addition of 10*d.* per ton per mile to the original cost.

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* Letter III., p. 7.

† 'China in Transformation,' p. 103.

In order to compare these figures with the rates charged in countries where the means of communication by land are better than in China, I am able, through the kindness of a friend, the manager of a Scotch colliery near Kilmarnock, to give an example very apposite to that of the carriage of the coal from the mines near Wei-hsien to that city. He informs me that down to 1872, when the railway became available, the average cost of carriage of coal by cart from the mine in question to Troon or Irvine, each about 9 miles distant, was equivalent to a trifle more than 2*s.* per ton, or about 2·7*d.* per ton per mile, little more than one-third of the general average given by Richthofen, little more than the much smaller average given by Bourne for Yunnan, and only a small fraction of that charged from the mines in Shantung to Wei-hsien.

If railway charges are compared, the following (for finished iron and steel goods) may be noted :—

From Staffordshire to London, 1·33*d.* to 1·50*d.* per ton per mile.
From Liège to Antwerp, 0·51*d.* per ton per mile.**

Coal is carried by rail in England at from ½*d.* to a 1*d.* per ton-mile, and in the United States for much less.††

It is such facts as these that warrant the belief that a tremendous economic revolution is bound to be brought about by supplying China with the means of transport already introduced into other parts of the world.

There is less difference between the cost of carriage by inland waterways in

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* 'Foreign Office Report,' Miscel. Series, No. 458, p. 57.

† Letter VII., p. 70.

‡ 'Travels and Researches in Western China,' pp. 194, 195, 197.

§ 'Land of the Lamas,' pp. 299–301.

‖ *Proc. R.G.S.*, vol. xl. (1870), p. 211.

¶ At some of the mines the cost is under 6*d.* a ton.

** 'Report of the Delegates of the British Iron Trade Association to inquire into the Iron and Steel Industries of Belgium and Germany" (1896), p. 14.

†† In a paper read before the North of England Institute of Mining and Mechanical Engineers on April 10, 1897, Mr. Jeremiah Head, M. INST. C.E., stated that at the time of his visit to the south-eastern mining and iron-working districts of the United States, coal was carried from Birmingham, Ala., to Pensacola, a distance of 258 miles, for 4*s* 6*d.* per ton, including shipping charges, or, say, 0·2*d.* per ton per mile.

China and that in other countries, and for the most part the difference appears to be to the advantage of China. The average of about 7*d.* per ton per mile given above on the authority of Richthofen as the general average for China, is stated by him to be from twenty to forty times as great as that for rivers of easy navigation,* so that, he says, it is the length of transportation by land which comes almost solely into consideration in that country. This is, of course, specially true of southern China, where alone water-carriage enters generally into competition with land transport. A land carriage of 20 miles takes away all profit in the trade in Hunan coal.† Here it may be incidentally pointed out that this fact speaks volumes for two things—first, the great value of the anthracite of Shansi, which, as above stated, will stand the charges of an exceptionally costly land journey of 80 miles through a mountainous country in order to reach, not a waterway, but the edge of the plain; and, second, the greatness of the difference in the economic situation that the introduction of an improved means of land transport in that region is likely on that account to accomplish.

But notwithstanding the great difference that already exists in China between the cost of land and water carriage there seems to be good reason for believing that, at least in the better waterways of that country, considerable economies might be effected by the introduction of modern methods of carriage. Travellers seem in many cases to have an inadequate idea of what can be accomplished by means of light-draught steamers, or have made statements that may have been true enough when they wrote, but are no longer true now that great improvements have been made in the construction of such steamers.

Richthofen regards the Siang-kiang in Hunan as unsuited for steam-navigation.‡ Mr. Morrison did not think a steamer drawing more than 3 feet could run regularly on that river as far as Siangtan,§ and above that point there are, he says, some shallow places where the stream runs very fast, which would probably be insuperable difficulties in the way of steamboat traffic. Dr. Kreitner considered Fancheng, opposite Siang-yang, on the Han river in Hupeh, as the probable limit of steam-navigation during the winter (low water), although he states that at Lahokou, about 70 miles higher up, the winter depth is from 3 feet 3 inches to 5 feet, the width about 220 paces, and the current only about 2 feet per second.‖ Light-draught steamers now navigate much shallower waters than these, and it is particularly worthy of note that such steamers are capable of carrying a much larger cargo than is usually conveyed in junks on Chinese inland waters. The highest carrying capacity of any vessels that I have read of anywhere in China, except on the Yangtse below Ichang, is 150 tons.¶ In view of these facts and statements, it may be worth while to insert here the following particulars, showing the dimensions and carrying capacity of small, medium, and large light-draught river steamers, from a table with which Messrs. Yarrow & Co., shipbuilders, Poplar, have been kind enough to furnish me:—

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* Letter III., p. 7.

† 'First Decennial Report of the Imperial Maritime Customs,' p. 173.

‡ Letter I., p. 10.

§ *Proc. R.G.S.*, 1880, p. 158.

‖ 'Die wissenschaftlichen Ergebnisse der Reise des Grafen Béla Széchenyi in Ost-Asien, 1877–80' (Vienna, 1893), p. 110.

¶ Junks up to this size navigate the rapids of the Yangtse between Ichang and Chungking, but they are comparatively few, the larger junks on this passage having for the most part a carrying capacity of only 60–70 tons ('First Decennial Report of the Imperial Maritime Customs,' p. 135).

Length.	Beam.	Draught (light), steam up.	Speed (light), steam up.	Load carried on— 12 inches.	18 inches.	24 inches.	36 inches.
Feet.	Feet.	Inches.	Miles.	Tons.	Tons.	Tons.	Tons.
70	14	9½	8½	4	13	23	43
100	20	11½	10½	2	21	40	81
180	36	12	13	0	61	124	259

In the case of the Siang river, it seems to have been the remarkably low cost of carriage by native boats than the nature of the stream that induced Richthofen to think it would be vain to attempt to introduce steam-navigation for the coal traffic there. At the time of his visit, the cost of the carriage of coal on the part of the river easiest to navigate, and on the Yangtse, from Siangtan to Hankau, a distance of 273 miles, was 36,000 cash per 400 piculs, which is equivalent to 0·263*d.* per ton per mile, the tael being taken at 6*s.* 4*d.* "No steamer and no railroad would carry coal," he says, "for so low an amount as the boatmen of Hunan do."* But, with reference to this opinion, one cannot help asking whether the nature of the river makes it utterly impossible to imitate in any degree the system of tows (barges lashed together and propelled—that is, pushed by single stern-wheel steamers) practised on American rivers, and ensuring on the Ohio and Mississippi, it is boasted, the cheapest carriage in the world. By one such tow, consisting of 38 pieces, as much as 25,900 tons of coal have been sent down from Louisville at one time, and by the same system coal has been conveyed from Pittsburg to New Orleans, a distance of 2000 miles, at 60 cents (half a crown) per ton. This is equivalent to a rate of only 0·015*d.* per ton per mile.† No doubt the rivers of China do not allow of the system being practised there on this gigantic scale, but is it quite impossible to effect any economy by applying it at all? Low as the Chinese rate is, the margin in favour of the American rate is considerable. It is scarcely possible to believe that no economy can be brought about by the introduction of so manageable an agent as steam in some way or other. Probably, therefore, the throwing open of all the rivers in the provinces of China containing treaty-ports will prove to be a very important concession for the development of the empire on Western lines.

INLAND WATERWAYS.

In addition to the foregoing general observations, some further notes are required in elucidation of the map so far as it indicates the inland navigation.

It must be stated at the outset that the indications there given are far from complete. I have inserted no indication except where I have been able to procure more or less definite data, and I have not always been able to procure particulars of the same kind for different rivers. This makes it impossible to make such a map self-explanatory.

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* Letter I., p. 6.

† U.S. Census, 1890. 'Report on Transportation Business,' Part II.: 'Transportation by Water,' p. 410. The figures there given show that this system of transportation must be well adapted to meet competition, which has been telling severely on the ordinary steamer traffic of the rivers. While the amount of freight moved on steamers in the Mississipi valley decreased from 13·56 million tons in 1880 to 10·35 millions in 1889, that carried on the tow system increased in the same interval from 5·39 to 19·06 million tons (254 per cent.). The increase on the Ohio was even more striking—from 2·52 to 12·23 million tons (385 per cent.), against a decline in the ordinary steamer traffic from 9·2 to 3·8 million tons.

Throughout China the navigability of the rivers is greatly affected by the regular occurrence of high and low water, high water occurring in the summer and early autumn—that is, during and immediately after the summer (monsoon) rains. The difference between high and low water is in some cases enormous. At Ichang, on the Yangtse, the height of the river varied in the ten years, 1882–91, between 1 foot 5 inches below low-water mark (on March 21, 1889) and 46 feet 2 inches above low-water mark (on July 12, 1883). At low water the depth on the south bank is in some places 10 to 12 fathoms. High water continues at this place from the beginning of July to the end of September.*

These fluctuations affect the navigation in various ways. Where rapids occur, the time of low water is generally the most convenient for navigation, especially up-stream, owing to the extreme difficulty of overcoming the velocity and force of the current. This fact limits the usual size of the boats employed in such stretches. Winter is accordingly the usual season of navigation on the Yangtse between Ichang and Chungking, which makes an unfortunate break in the connection with the navigation of the part of the river below Ichang. For between that port and Hankau, on account of the occurrence of certain shoals at low water, the most serious being at Sunday island (at the sharp bend of the river south of Shashi, north of the Tung-ting lake), the most convenient period of navigation is that of high water. Whether the rapids of the Yangtse could be navigated by steamers during high water is doubtful. Up to the present time only one steamer, a launch, as the owner, Mr. Arch. Little of Shanghai, has kindly informed me, 55 feet long and 10 feet wide, has ascended this portion of the river, and it arrived at Chungking on March 8 (this year), after a three-weeks' voyage.

On the upper, mainly west to east, portion of the Han, where the river runs through mountainous country and rapids are exceedingly numerous, high water renders progress up-stream very slow, so that in summer it takes about five months to ascend from Hankau to Hanchung, while under the most favourable conditions this ascent may be accomplished in about half that time.†

In the lower Han high water creates a difficulty of another kind. While the banks of the Yangtse are always visible, the natural banks of the lower Han are completely submerged at high water, and for long distances (between Yokou and Iching) not a tree or a house is visible to mark their situation.‡ Hence there is great difficulty in keeping to the navigable channel.

I have endeavoured to indicate on the map in certain cases the limit of navigation for larger vessels, but this also requires some explanation.

In northern China, so far as I have been able to ascertain, only the smaller class of junks are made use of. As is well known, the Hwang-ho, the longest and largest river of all northern China, is of very little use as a waterway, in consequence partly of its rapidity, partly of its shallows. The lowest navigable stretch on this river is indicated in accordance with the statements of Richthofen.§ On this stretch, he says, the boats should not draw more than 3 feet, and most of them draw only 1 foot. Above Meng-hsien, the upper limit of this stretch, situated close to a ford celebrated and strategically important in early Chinese history, the river, he states, is properly not navigable to the great bend. Above this latter point it becomes navigable again as high as Lungmen ‖ (the "Dragon-gate"), but on this part of its course it

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* 'First Decennial Reports,' etc., pp. 143, 144, with accompanying diagram.

† *Proc. R.G.S.*, 1890, p. 64.

‡ Richthofen, Letter II., p. 2.

§ Letter III., p. 7.

‖ Erroneously marked on the map as a town. The name recurs in China for the mouth of a rocky gorge.

is little used except for the conveyance of coal, generally on rafts, from the mi
at Hotsin-hsien, near the confluence of the Fen-ho, to Yenyang-hsien, on the W
the river-port of Singan-fu. On the west side of Shansi, above Lungmen, the ri
is entirely unnavigable; but higher up, between Ning-hia and Bautu (Pautu
Pauto), there is considerable wool and grain traffic down-stream, the boats be
towed up-stream (? empty).* Mr. Littledale rafted down the river from Lanch
fu to Ning-hia, passing a bad rapid on the second day. The dimensions of the r
were 50 feet by 18.†

Both Richthofen and Ney Elias took Lungmenkau, a little below the po
where the Hwang-ho finally turns north-east, as the lowest limit of navigation
that river. Mr. Morrison, however, states that at the time of his visit (18
large boats, drawing probably 7 or 8 feet, could come up from the mouth as far
Chiho (or Tsiho) -hsien (nearly due west of Tsinan-fu), and adds that all the hea
machinery for the arsenal at Lokou, the river-port to the north of Tsinan-fu, w
brought up the river.‡ Whether the mouth of the river is still to be regarded
navigable after its change of course in 1887 and subsequent restoration to
former bed, I have not learnt.

On the Wei, the great tributary of the Hwang-ho, navigation, according
Dr. Kreitner, is confined to the portion below the place already mention
Yenyang-hsien, and even on this portion he adds that it is of subordin
importance—a fact that is somewhat surprising when we consider that he fou
the depth here, in February, to be from 2 to 3 metres.§

I have marked the northern limit of easier navigation on the Grand Canal
the old bed of the Hwang-ho, because from this point southwards it is a fine wat
way affording uninterrupted communication to Shanghai, while north of that po
it is at a higher level, and, there being no locks, the passage of boats upwards
"well-nigh impossible."‖ In the rare cases in which this is done, sluices
opened against the current, which may be flowing at a rate much beyond 10 mi
an hour. In the southern section of the canal, below the limit indicated, bo
drawing at least 5 feet were constantly running at the time of Mr. Morriso
visit, while in the northern section there were many places not 3 feet deep.

With regard to the navigation of the Yangtse and the Han, nothing need
added except that, according to the First Decennial Report of the Imperial Mariti
Customs,¶ the best kind of steamer for the Hankau-Ichang traffic is a power
single stern-wheel vessel of a carrying capacity of 600 tons, with a draught n
exceeding 5 feet, and an average speed of from 10 to 12 knots, if possible.

Though the province of Sze-chuen has so many navigable rivers of the Yang
basin, these differ greatly in value. While, for example, the Lu-ho, Tung,
Tatu-ho is marked as navigable like other rivers of the Red basin, it is little sui
for navigation anywhere on account of its numerous rapids, and in part of
navigable course it is practicable only for rafts, and even for these is so dangero
that the owners of the timber have to make the ominous stipulation to provi
the raftsmen with coffins in case of fatal accidents.** The most important wat
ways of this part of the Yangtse basin are the Min, which is regarded by
Chinese as the true headstream of the Yangtse, and the Kialing, or, as it is cal
at Chungking, the Siao-ho, or Little river, already referred to for its coal traf

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* Geog. Journ., vol. iii. p. 470. † Ibid., pp. 458–470.

‡ Proc. R.G.S., 1880, pp. 130, 132.

§ Béla Széchenyi, "Die wissenschaftlichen Ergebnisse," etc., pp. 331, 332.

‖ Proc. R.G.S., 1880, p. 165. ¶ P. 229.

** Baber, "Travels and Researches," etc., p. 45.

This is one of those rivers which will probably acquire much greater importance through the introduction of steam traffic. At Paisuikiang, where the navigation begins on the borders of Kansu and Shensi in about 33° 50′ N., it already has a depth of 10 feet.* According to the Foreign Office Report, Miscellaneous Series, No. 457, the capacity of the junks that ascend as high as Pao-ning-fu is 30,000 catties (about 18 tons). Mr. Arch. Little has been good enough to inform me privately that there are some junks on it over 100 feet long, 11 feet beam, and 5 feet draught, yet carrying only about 50 tons.

It is in the south-eastern part of China that our map is most inadequate in representing the Chinese waterways, which are in all parts of this region the most important means of communication, though varying greatly in the facilities they afford for it. This is the region traversed by what Richthofen calls the Nanshan or Hilly Belt of the south-eastern provinces, and here, says Richthofen, denudation has been active for so long a time, that much of the unevenness of the surface has been smoothed away, and almost all the rivers are in some sort navigable streams, according to the ideas and practice of the local Chinese. Many of them are full of rapids, but various circumstances combine to enable the Chinese to make use of these rivers for navigation in spite of obstacles which could not be encountered with success in Europe. They drag their boats over rapids that would be regarded by us as putting an end to navigation, and across where the water flows with great velocity over pebbly ground at the depth of 1 or 2 inches.† In the future we may expect such rivers to be superseded entirely by railways, wherever it is worth while to lay railways along their valleys, while the rivers of easier navigation will no doubt continue to be made use of, at least for the heavier traffic.

I have represented the Siang river as of easy navigation as high as Heng-chau. This I have done on the strength of a recent Foreign Office Report (No. 2126 of the Annual Series), where, on p. 10, it is stated that a recent survey has shown that steamers drawing not more than 9 feet could get there at any time. If this is correct, it is strangely at variance with the views of Richthofen and Morrison above referred to.‡ The connection of the upper part of this river by canal with the Fu-ho or Kwei (a river full of shallow rapids §) on the other side of the mountains, in Kwangsi, is available only during the rainy season for boats drawing not more than 2 feet.‖ None of the other main streams entering the Tungting lake is to be compared with the Siang as a waterway. On the Yuan, rapids begin about 45 miles above Changte-fu, and continue all the way up. Freight on it is about seven times as high as on the Siang. The Tse is navigable only by the smallest kind of boats.¶

In Kiangsi, the Kan- (or Kia) kiang, the main artery of the province is extremely difficult to navigate in its upper reaches,** though it is used as a waterway up to Nanngan (Nan-an) at the foot of the Meiling pass, that town having formerly (before the interruption of the Grand Canal) been the terminus of an inland line of waterways beginning at Peking. Several of the other streams of the Poyang basin are more or less important in the same respect. In the north-east, the limit of "still and deep water" is stated by Richthofen †† to be 120 miles above its mouth in the direction of Kintechin and Loping—that is, on the north-east branch of the Po river, which is valuable as a carrier of "keemun" tea, as well as porcelain.

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* Béla Széchenyi, 'Die wissenschaftlichen Ergebnisse,' etc., p. 217.

† Richthofen, Letter IV., p. 7.

‡ P. 505.

§ *Proc. R.G.S.*, vol. xxxviii. (1868), map opposite p. 51.

‖ Ibid., p. 61.

¶ Richthofen, Letter I., p. 3.

** Ibid., Letter IV., p. 7.

†† Letter I., p. 10.

from the imperial factory at Kintechin, and the eastern branch, which carries down "moyune" tea and Loping coal. The Shang-jao, or Kin-kiang, the next river to the south, on the same side, forms the main avenue to the province of Chekiang, and carries down chiefly paper, while the Fu-ho, still further south, flows through a valley yielding tobacco, hemp, and grass-cloth.

In the deltaic region of Kwantung the waterways are naturally numerous. On the Si-kiang I have marked Wuchau-fu as the limit of easier navigation, this being the place up to which, according to Agassiz,* steamers of 8 feet draught might ascend.

British steamers of 7-feet draught are now running regularly to this point,† and, according to Mr. Colquhoun,‡ it is quite certain that this river could be opened to steam-navigation as high as Nanning.

RAILWAYS AND RAILWAY PROJECTS.

That the means of transport at present in use are totally inadequate to open up the enormous resources of China is obvious. It is also known to every one that nothing but the hostility of the Chinese government has prevented the introduction of railways into the country long ago. The first railway in China, from Shanghai to Wusung, was laid in 1876, and was eagerly made use of by the people; but in the following year it was bought and torn up by the authorities. The next line made was that from the Kaiping collieries to navigable water, ultimately continued to near the Taku forts on the Gulf of Pechili, and now replaced by a well-made line running from this point to Tientsin and Kaiping, and thence north-eastwards by Shanhaikwan into Manchuria. In the summer of 1897, a line 73 miles long, from Tientsin to Peking, laid by British engineers, was opened, and so largely has this been taken advantage of that its doubling is now in rapid progress, and is expected to be completed in the autumn of this year. Another railway, running southwards from Peking, and ultimately intended to reach Hankau, is now in course of construction, under a concession to a Belgian company, and has already been completed as far as Pauting-fu, its first portion running parallel to the road, and close to the headwaters of the navigable rivers of this district.§ A branch is being made to the mines of Fangshan-hsien, which supply Peking with anthracite. An industrial line for the conveyance of iron ore from the mines of Tiehshanpu in Hupe to a point on the Yangtse, about 70 miles below Hankau, constructed by the viceroy for the supply of the great ironworks erected by him at Hanyang, was opened in 1892. A second railway from Shanghai to Wusung was opened in August this year. So far these are all the lines already existing in China.

It seems likely, however, that railway construction will now go on apace. "Once judiciously begun," says Mr. Colquhoun, "who can doubt the rapid and profitable extension of the railway throughout China?"‖ It must be borne in mind that when once a single great trunk line has been established, the present economic equilibrium in the country will be disturbed, and the regions that are thus prejudiced, though now perhaps indifferent or hostile to this innovation, will begin to clamour for it. Numerous projects for Chinese railways have accordingly long been set forth, and in what follows I give for the most part an abstract of the schemes suggested by the late Dr. Kreitner, and expounded by him in great detail in vol. v.

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* *Proc. R.G.S.*, 1891, pp. 256–260.

† 'Foreign Office Report,' Annual Series, No. 2108.

‡ 'China in Transformation,' p. 138.

§ See the account of a journey along the route in 'Foreign Office Report,' No. 466.

‖ 'China in Transformation,' p. 92.

of the *Revue Coloniale Internationale.* This is the most comprehensive and minute study of the subject with which I am acquainted, and several of the routes proposed and examined by him are identical with those for which concessions have been obtained or are being asked for.

Dr. Kreitner begins with the consideration of three proposals that had been made for the connection of the Russian railway system of China—that of Meissel by Kiakhta and Urga to Peking; that of Bogdanovich by Chita, Khaitu, and Dolon-Nor (Lama-Miao) to Peking; and that of Richthofen by Semipalatinsk and Hami to Singan-fu. Since Dr. Kreitner wrote, however, political events have made it certain that the first connection of this kind will be made further east, by means of the Trans-Manchurian line to be constructed under an agreement between Russia and China, and expected to be completed by August, 1903.

A connection with this line by a continuation of the Tientsin-Shanhaikwan line cannot fail to be brought about, and this will probably prove of the utmost importance for the conveyance of agricultural produce. For many years Manchuria has been in a large measure a Canada for China proper, increasingly so in recent years; the development of the great northern coalfields of China and of the industries likely to be associated with that development is bound to create a great demand for food-stuff, for a mining and industrial population, and no region seems better fitted to supply this demand than Manchuria. Since our map was printed, the extension of the Shanhaikwan line in the direction of Niuchuang and Hsi ming ting (? Sinmin tun) has been arranged for under a contract with the Hong-kong and Shanghai Bank.

But the carrying out of these Manchurian projects would not hinder the realization of one or other of the schemes mentioned above for establishing a more direct connection with the Trans-Siberian railway, and of these three schemes Dr. Kreitner adheres to that of Richthofen, treating it as part of a great railway line ultimately to connect Peking with the middle of Siberia. If only geographical and economic considerations are taken into account, such a railway will undoubtedly be required.

This railway Kreitner calls the North China railway. Its total length from Peking by the Hwang-ho valley route (south of Shansi) to Singan-fu, and thence to Ansi-chau (Ngansi-chau) on the south side of the desert route, is given by him at 1840 miles. The first part of this route is that which has already been constructed to Pauting-fu, and which is common to it, the Taiyuen (Shansi) line and the Hankau line. On this route no difficulties whatever would be encountered till one had passed Meng-hsien, the place already mentioned at the upper limit of the lower Hwang-ho navigation as shown on the map, a few miles below the mouth of the defile of the Hwang-ho; but above that point as far as Tungkwan (the town situated near the sharp bend where the Hwang-ho changes its course from south to east) there are serious obstacles, due to the fact that loess precipices 150 to 300 feet high descend sheer down to the river, now on the right bank and now on the left. The precise alignment could be determined only after a careful survey. There would be no engineering difficulties in bridging the Hwang-ho at Tungkwan, though the left bank here descends perpendicularly to the water's edge in a precipice 260 feet high, while the right rises in terraces to about 650 feet in places. The bed is here sandy, the water shallow, and the banks firm, and in spite of the small breadth of the stream, about 700 feet, the bed contains some shallows and banks which would favour the erection of piers. Between Hwaiking-fu and Tungkwan a different route is suggested by Richthofen, his line first running south-west to Honan-fu (crossing the Hwang-ho at the ford of Meng-hsien), then westwards on the right bank of the river.*

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* See Map 3 to 'Schantung und seine Eingangspforte Kiautschou,' by Ferd. Freiherr von Richthofen. Berlin, 1898.

From Tungkwan to Singan-fu* there would be no difficulties, but beyond Singan-fu, to follow the present cart road (shown on the map) would be no easy matter, as might be guessed from the section on the sheet following our map (based on that by Dr. Michaelis on Plate II. to *Ergänzungsheft*, No. 91, to *Petermanns Mitteilungen*).

The more southerly route up the valley of the Wei, and thence north to Anting (Nganting-hsien), would be easier and cheaper. Difficulties on this route as far as Pauki-hsien are absent, but west of that point the Wei valley contracts and appears to retain a ravine-like character to the mouth of the Si-ho (east of Tsing-chau). Of the nature of this gorge nothing definite is known, but from the aspect presented by the valley of the Wei when seen from the heights to the south of Tsing-chau, it may be concluded that in this portion of the route a good deal would have to be done in the way of blasting, construction of stone embankments, protecting walls, and so forth.

For the bed of the railway on the Lanchau-fu Kulang-hien stretch there is ample stone, but iron or stone would have to be used for sleepers. Water and fuel are abundant, there being rich coal deposits at Lanchau-fu, Pingfan-hien, and Kulang-hien. Beyond this point, as far as Hami, no physical difficulties worth mentioning would be encountered.

One of the lines for which a concession has actually been granted, would branch off from this line in Pechili for the anthracite field of Shansi and the town of Taiyuen-fu. It would follow the present cart-road through a country of considerable difficulty, as already indicated, and as shown by the altitudes given on sheet 15 of Richthofen's Atlas. Starting at an altitude of 255 feet at Hwolu-hsien, at the edge of the plain, it first rises to 2840 feet, then descends to 2350 feet, in order to rise again to 2860 feet at Pingting-chau, and beyond that ultimately crosses a pass 4850 in height before descending to the plain of Taiyuen-fu.† The concession has been granted to the same Anglo-Italian company as has obtained the right to work the minerals of the province, and arrangements are said to have been made with the Russo-Chinese bank for the actual construction.

Another line for which a concession has been granted (nominally to a Belgian company), is one following the Peking—Singan-fu line of Kreitner as far as Weihui-fu, and proceeding thence southwards to Hankau. This line is not one of those considered by Kreitner; but, though several rivers would have to be bridged, probably no serious difficulties would be met with, except perhaps in crossing the mountains forming the water-parting between the Huai-ho and the Yangtse.

Another line diverging from the northern line at Weihui-fu is Kreitner's proposed Peking—Shanghai line, that line proceeding eastwards from Kaifeng-fu to Hwai-ngan, and then running south parallel to the Grand Canal. A branch from Hsichau could bring it into communication with the coalfield of Ichau, in Shantung. A train-ferry across the Yangtse would have to be established north of Chinkiang, and he considers that the differences in level of the Yangtse would best be met by means of platforms capable of being raised and lowered by hydraulic pressure, as at Homberg-Ruhrort on the Rhine. On the Suchau-Shanghai section, the line would run on the north side of the "Suchau creeks" past Kwanshan.

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* The altitude given on the map for this town is that of Richthofen's Atlas (1513 feet), slightly rounded, that adopted also by Bretschneider on his map; but the altitudes found by different travellers at this place are strangely divergent. The Béla Széchenyi expedition, on the basis apparently of five days' aneroid-readings in January (1879), arrived at an altitude of 1065 feet. Dr. Hermann Michaelis about the same time found one of about 1000 feet (307 metres). The altitude determined by Colonel Bell, on the other hand, was 1700 feet (*Proc. R.G.S.*, 1890, p. 62); and that of Rockhill, on the basis of a boiling-point thermometer observation, 1809 feet ('Land of the Lamas,' p. 25, and Appendix).

† See also Richthofen, 'China,' vol. ii. p. 437.

A more easterly north-south line is regarded by Kreitner as superfluous, at least in the first instance, on account of the numerous navigable waters of the Hwang-ho plain; but, with the exception of the Grand Canal, these waterways do not form a due north-south route. Mr. Colquhoun, indeed, thinks that no railway in China would give more promise of immediate success than one from Tientsin to Chingkiang and Hangchau, and ultimately to Canton,* and the marked success of the Tientsin—Peking line seems to augur well for the prospects of another line through the most populous parts of the Chinese plain. Arrangements are now said to have been made for the construction and working of this line under joint German and British control, German management to extend as far south as the southern frontier of Shantung, while the remainder of the line is to be under British management. The German section would, no doubt, partly coincide with the western portion of that circuit of railways in Shantung for which the Germans had previously obtained concessions.

Besides the Peking—Shanghai line by way of Weihui-fu, the only railway connection between the North China railway and the Yangtse valley that Dr. Kreitner suggested, was by what he calls the Sinling (Tsinling) railway—that is, a line connecting Singan-fu with Hankau; but it can hardly be supposed that, if railways once existed in the Hwang-ho and Yangtse valleys, there would be no railway laid through the Nanchau pass in the Funiu-shan range, so as to bring Honan into connection with the Han valley by way of the valley of the Pei-ho. The pass in question is only between 1000 and 1500 feet in height, between mountains of 4000 to 5000 feet on either hand, and "the grade is so gentle, and the width of the passage so favourable, that a railroad could be built through it without the slightest difficulty." † This would be the route by which the anthracite of the great Shansi coalfield would be most easily made available in the middle Yangtse valley.

Reaching the Han valley at Fancheng (opposite Siang-yang), it would there join the Sinling line of Dr. Kreitner, the only possible direct route between the middle Yangtse and the north-west of China—one, accordingly, that may almost be regarded as inevitable in spite of no slight difficulties to be overcome.

Beginning at Hankau, this railway would meet with no difficulties in the first 45 miles to Nganlo-fu. Almost equally easy would be the section Nganlo-fu-Siang-yang (73 miles); but the Pei-ho (Pai-ho), almost 100 miles broad, would have to be crossed 5 miles below the latter city. The first difficulties, indeed, occur above Sie-kiang-kou (65 miles above Siang-yang), where—or rather at the point of the left bank of the Han-ho opposite that town—the line would leave the valley of this river and ascend that of the Sie-ho (Tan-ho). Here, in the course of 12½ miles before Likwan-chau, the line would have to traverse a valley-bottom involving in many places blastings, and the construction of embankments and protecting walls. At Likwan-chau the line begins to cross a side valley, 10 kilometres wide, whose bottom consists entirely of shingle and sand, showing that in the time of the summer rains the apparently insignificant stream may swell to a destructive torrent, so that here it would have to be carefully considered whether it would be sufficient and best to build a protective embankment, or to carry the line across a bridge supported by low stone pillars. Above Tsechuen (Sichuen), 23½ miles beyond Likwan-chou, the gradient becomes steeper, but not more than 1 : 100, and at Kintsekwan, 22 miles beyond Tsechuen, on the section, 84 miles long, between Kintsekwan and Lungkuchai, the line would have to leave the route of the existing road or bridle-path, keeping close all the way to the left bank of the Sie-ho instead of making the ascents and descents shown in the section of Mr. Michaelis, and copied on the sheet following our map. Although in this section the average gradient would be only 1 : 430, yet a good deal of blasting and tunnelling would be required.

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* 'China in Transformation,' p. 106.

† Letter III., p. 4.

An easy section of 38½ miles next follows, but in the remaining 43½ miles to Mohakwan, at the summit of the Tsinling mountains, it would be necessary, in order to obtain a gradient of 1 : 100, to make a deviation of 12½ miles up a northern valley. On the other side, descending to Singan-fu (75 miles), a similar gradient would be achieved by deviating eastwards round the head of the valley of the Lantien-ho.

Dr. Kreitner, as well as others who have studied the railway question in China, have relegated to a more or less distant future the construction of any railway along the lower Yangtse valley, where there would be competition with large river steamers. A railway starting at Hankau to ascend that valley is, however, in a different position. This proposed line he called the Yangtse railway; but for the first part of its course above Hankau, it does not answer to its name, inasmuch as it follows for 112 miles the left bank of the Han-ho. This region is an extensive and very fruitful plain, traversed by numerous canals, and interspersed with small lakes and ponds. The embankments raised against inundation in this region might be utilized for the railway to King-chau.

Above this point, as high as Ichang, a few blastings of the Tiger's Teeth gorge and a short iron bridge over a small tributary which here enters the Yangtse, are all the serious works required, but between Ichang and Yinyang, a distance of 141 miles, the difficulties in the way of railway construction are very formidable. Immediately above (north of) Ichang there begins a gorge, 15½ miles long, affording absolutely no room for a railway. From a railway engineering point of view, the one advantage of this gorge is that here the Yangtse might possibly be bridged, the river being here only 1000 to 1300 feet broad, but with a depth of 18 fathoms. The route for the railway to avoid this gorge could be determined only after careful survey. After crossing this hill, it would again reach somewhat lower parts of the valley, where the difficulties at the Shantanpien and Tatung rapids, and up to the first fall of the Niukan gorge, 23¾ miles above the upper end of the Ichang gorge, though moderately great, are not so formidable as in the lower part of the course just referred to. At this second gorge it would probably be easier to lay the line along the upper edge of the cliffs at the height of 230 to 260 feet above the river, than to force it along the river-banks by means of blastings, tunnels, and viaducts, and the line might be kept at the height of about 160 feet till the Mitan gorge was reached, where the cliffs on the left bank, though apparently impassable at the foot, yet seem to offer greater facilities for the laying of a railway at the height of 250 to 300 feet above the river. Special difficulties would have to be met in the upper parts of the Mitan gorge. Thence to Kui-chau (5½ miles *) the route is easy. Here there would be an important coal station, the mountains in the neighbourhood containing coal. Other 26½ miles of easy construction follow till the east end of the Wushan gorge is reached. This is the longest and most difficult of all the defiles of the Yangtse, the river being here bordered on both

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* A different place from the Kui-chau (Kui-chau-fu) on our map. It is about 56 miles by rail above Ichang.

sides with little interruption by perpendicular rocky cliffs. The line accordingly would be compelled to leave the valley-bottom at Putung-hien. From this point it would run as a mountain railway above the cliffs along the side of a very steep slope, 650 to 1150 feet above the stream. Viaducts, bridges, tunnels, dams, cuttings, embankments, etc., would make this portion one of the most costly pieces of railway construction in the whole empire, but as a means of establishing a commercial connection with the rich province of Sze-chuen, it cannot be avoided. The length of the stretch, Patung—Wushan, is somewhat more than 37 miles.

When the latter town is reached, however, the greatest difficulty in the construction of the Yangtse railway is overcome. The valley becomes more and more open, richer, more fruitful, and more populous. The cliffs advancing up to the river-bank in the 25-mile stretch from Wushan-hien to Kui-chau-fu are inconsiderable both in length and height, could for the most part be easily avoided, or, as in the case of the Fung-seang gorge, 3 miles long, east of Kuichau, the line could be laid without any considerable difficulty on the ground above the rocks.

Between Kuichau-fu and Chungking-fu no noteworthy difficulties occur. The total distance is 310 miles.

The bridging of the Kialing-kiang, or Siao-ho, at Chungking, which Dr. Kreitner, in the absence of definite information with regard to this part of the river, estimates to have a breadth of at least 800 feet, would be the next costly work on this line. Between Chungking and Chengtu-fu Dr. Kreitner's proposed line deviates from the regular trade route, in order to avoid the highly diversified country followed by the latter.

Running parallel to the North China and the Yangtse valley railways, Dr. Kreitner conceived a third east-west trunk line in the basin of the Si-kiang, which he called the South China Railway. This line, he believed, ought to start from the bank of the Si-kiang, at the north-west end of the city of Canton, and then run first north-westwards to a point opposite the south point of the Balcher island, where the Pearl river would be most easily crossed by means of three bridges. From Fushan, 3½ miles from Canton, it would run first in a straight line to Hsinam, or, in the Canton dialect, Sainam, east of which town a narrow canal would have to be bridged. The line would then change from a north-westerly to a westerly direction, running in the latter direction to Samshui-hien (19½ miles beyond Fushan), at the confluence of the Pei-kiang. This river would then be bridged at a point where two islands lie in the stream. The line would then go up the right bank of the Si-kiang, crossing eight canals before reaching the lower end of the Shaohing gorge, at the upper end of which stands Chao-ching-fu, 31 miles above Samshui. No difficulties are mentioned by Dr. Kreitner in connection with the Shaohing gorge, and the first costly work that would have to be undertaken on this line above Samshui would be the bridging of the Lishui, which enters the Si-kiang at Fengchuan-hien, 117 miles above Samshui. The breadth of this river is estimated at about 200 yards. As far as Wuchau-fu, 44 miles further on, the work of construction would be very easy, but on the west side of this town the bridging of the Fu-kiang, or Kwei-kiang, the costliest work of the kind on the whole of the South China railway, would have to be undertaken. The river is here from 1050 to 1100 feet wide, and 6½ feet deep, and has firm banks.

The route up the lower Pak-ho, instead of that up the Si-kiang, is selected by Dr. Kreitner partly because he considers it desirable for China for defensive reasons not to lay the railway too near the frontier of Tongking, and partly on account of the difficulties presented by this latter route, in consequence of the great differences in altitude within short distances, in the way of continuing the line into Yunnan, in the neighbourhood of Kwangnan-fu. Apart from these circumstances, the richer southern valley of Kwangsi would be the better route to follow.

The further details of Dr. Kreitner's route need hardly be considered, however. Where it runs through explored country, the difficulties, on his own showing, are very considerable, and from Tunglan-chau, on the Hungshui-kiang, in about 107° E. to the Yunnan frontier, it runs through country about which all that is known is that it is wild, mountainous, without considerable towns, and very thinly peopled. It is generally admitted that, notwithstanding the differences in altitude between the Kwangsi valleys and the Yunnan plateau, illustrated in one of the sections accompanying our map (Kaihua to Pose*), the valley of the Yu-kiang, or left branch of the Si-kiang, is that which would afford the best approach to the latter province. The top of the plateau once gained, no great difficulties remain to be encountered on the way to Yunnan-fu. The route is well known from the travels of Colquhoun, Bourne, and Rocher.

Eventually this line would be continued to Tali-fu, the chief town of western Yunnan. Varied as the surface of this region is, the railway, keeping for the most part to the same route as the present commercial highway (a section of which is given from Baber on our map), would be carried to its goal without trouble. It would run throughout near the water-parting between the Yangtse and the Mekong and Songkoi, through a not very populous highland region, not ill-supplied with wood for building and fuel, and provided with adequate coal-supplies for the needs of the railway. Coalfields, as well as copper-mines, occur between Chuhsiung-fu and Chenan-chau † Its total length would be about 240 miles.

Among the difficulties to be surmounted are the Chiopan-shan pass (6070 feet), just beyond Lufeng-hien, 56½ miles from Yunnan-fu, involving a gradient of 1 : 80; the somewhat more arduous ascent of the next height, Menghsiapu, 7 miles, on the east side of Kwantong, where, coming from the east, an altitude of 600 feet has to be surmounted in a distance of about 3½ miles (average gradients of 1 : 75 or 1 : 80), and a descent on the other side of 440 feet to Kwantong, at first with a gradient of 1 : 75, afterwards one of 1 : 100; somewhat steep serpentine ascents and descents (up to 1 : 65) in the 51 miles between Chunghuatung and Chaochau, on the borders of the plain to the south of the Erh-hai, 6 miles from Hsiakwan, and 25 from Tali-fu.

Two connecting lines between the Yangtse and Si-kiang valleys are considered by Dr. Kreitner. He leaves altogether out of account the possibility of such a connection across the Cheling pass to Canton, probably in consequence of the adverse views of this route expressed by Richthofen.‡ In spite of the difficulties which Richthofen indicates, a concession for a railway following this route has been obtained by an American company, but the fact was made known too recently for the insertion of the line on our map.

Dr. Kreitner's upper connecting-line between the Yangtse and Si-kiang valleys is that which he calls the Siang-kiang railway, following the valleys of the Siang-kiang and Kwei-kiang.

On account of the difficulty of bridging the Yangtse-kiang, this line would have to start at Wuchang-fu, and connect with the Yangtse line at Hankau by means of a train-ferry, such as that also suggested above for the Chingkiang crossing.

On the choice of this route rather than that of a more direct route to Wuchau-fu, up the valley of the Tan-ho on the left bank, Dr. Kreitner remarks that this might prove, on examination, to be the best route. He did not know the province of Kwangsi personally, but was led to regard the Kweilin route as the most likely from the fact that the existence of the canal connection of that river with the Siang would seem to indicate that the tendency is for trade to follow that direction.

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* Based on data furnished in the "Report of a Journey in South-Western China," by F. S. A. Bourne (China, No. 1, 1880 [C. 5371]), before p. 69.

† At Chingyuanshan.

‡ Letter I., p. 2, note. See the passage quoted in *Proc. R.G.S*, 1880, p. 156.

The lower connecting-line between the Yangtse and Si-kiang valleys is the Kiukiang—Canton line through Kiangsi (up the Kan, across the Tayaling mountains, and down the left bank of the Pei-kiang), the total length of which would be 565 miles.

The name of the Tea District Railway was given by Dr. Kreitner to a line suggested by him between the treaty ports of Kiukiang and Fuchau, in order to bring the tea, tobacco, hemp, and paper districts of northern and eastern Kiangsi and western Fokien into rapid communication with the treaty ports above mentioned.

Starting from Kiukiang, the line first passes round the base of the northern and eastern spurs of the Lushan to the west side of the Poyang lake, and along this to the provincial capital of Nanchang-fu, but then, instead of following the route of the projected telegraph line by Fuchau (in Kiangsi) and Kienchang to Shaowu, it strikes eastwards to reach the tea-districts of eastern Kiangsi. The difficulties of crossing the frontier mountains on this route across the Maling (in the pass of Chungan between Chienshan-hien and Shaowu) are not greater than those encountered in passing the Yünling on the other (telegraph) route between Kienchang and Shaowu. From this place the line runs through the black tea districts of Fokien and in the valley of the Min to Fuchau, this valley being reached by a considerable serpentine curve to the north-east and south-east on the east side of the frontier pass. In the Min valley the line would first run on the right bank, and then, after crossing by a bridge above Yenping, on the left. For the direct shipment of the tea, it would be well to carry the line right on to the arsenal of Fuchau (Pagoda anchorage). The total length of the line would be 515 miles.

Richthofen has pointed out that another easy connection between the province of Kiangsi and the sea would be by means of a railway from Ningpo, following what he calls the Lanki valley *—that is, the line of valleys running nearly east and west across the middle of the province of Chekiang, formed by the valleys of two headwaters of the Tsientang-kiang, the Kinhwa and Kichau streams, meeting mouth to mouth, like the valleys of the San Joaquin and Sacramento in California. Crossing the water-parting separating Chekiang from Kiangsi, the line would descend the valley of the Kin-kiang.

In eastern Kwangtung, the laying of a line from Kaulun to Canton is urged in the interests of Hong-kong. On this route the only difficulties could consist in the bridging of the numerous streams of the delta of the province.

To reach the Si-kiang valley from the south, concessions have been obtained by the French for a line from Pakhoi to Nanning, and for the continuation to the same place of the line already begun from Hanoi by Langson to the valley of the Tso-kiang, or right headwater of the Si-kiang. The water-parting to be crossed on this route is probably not less than 3000 feet.†

The proposed French line from Laokai on the Red river (Song koi) to Yunnan-fu by Mengtse would have to surmount the same obstacle as that which would be met on the proposed line between Kwangsi (Yu-kiang valley) and Yunnan-fu, namely, the ascent of an altitude of about 6000 feet within a comparatively short distance. See the section from Manhao to Mengtse, reproduced from that in the

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* Letter IV., p. 11.

† Agassiz in *Proc. R.G.S.*, 1891, p. 251.

First Decennial Report of the Imperial Maritime Customs, China, compiled by Chr. Jensen of the Imperial Chinese Telegraphs, on the sheet accompanying our map.

In this country no Chinese railway projects have been more frequently and more keenly discussed than those for connecting China with Burma, but the only project of this nature that does not appear destined to encounter insuperable difficulties from the nature of the ground to be crossed is that first proposed by Mr. Colquhoun,* and described to this Society by Mr. Holt Hallett.† Starting from Maulmain, this line, after crossing two passes respectively about 1600 and 2300 feet high, would reach Raheng, in the valley of the Mehping (right headstream of the Menam), and then, proceeding northwards across a few passes all under 2000 feet in height, would reach the valley of the Mekong at Chieng-sen (in about 20° 15′ N.), and then proceed up this valley to Sumao, in southern Yunnan. To this route Mr. Colquhoun still adheres,‡ while he states that the continuation of the line already made from Mandalay to Kunlon ferry would meet in China with obstacles of a very serious character in the shape of mountain barriers running north and south.§

The further continuation of the proposed line to Sumao is among the projects discussed by Dr. Kreitner, who admitted that, while the difficulties of the route between that place and Yunnan-fu are great enough, they are nevertheless not so great as those which would have to be encountered in any attempt to connect China and Burma by more westerly routes—projects which must be dismissed as quite impracticable.

The first part of the route Sumao—Puerh, 28 miles long, traverses a much-cut hill country from north to south. On the west section, Puerh—Papien, on the Papien-ho, 31 miles, the extremely difficult intervening watershed, a steep-sided forest-clad mountain range, would have to be crossed. From this point the route would follow a tributary of the Papien-ho down to that stream, which at Papien is about 90 yards wide.

From Papien, running east-north-east to Yuankiang-chau, a distance of 70 kilometres, the line would ascend the rugged plateau of Tongkwan, and from it descend to a side valley (the river 80 feet wide, 3 feet deep). Then, continuing eastwards by Chang-luping and Talang-chau to Tienso, it would cross a mountainous country cut up by the valleys of several mountain torrents (the relative differences in altitude amounting to about 1000 feet). Between Tienso and Yuan-king the water-parting between the Papien-ho and Yuan-kiang (Songkoi), with a relative altitude of 3300 feet, has to be crossed—certainly no easy matter, though the exact route remains to be determined by a detailed survey. The remainder of the route is not without difficulties, though of a minor order compared with those already mentioned. The total length of the line from Sumao to Yunnan-fu would be 288 miles (see the section from Bourne, *ubi supra*, before p. 21, on the sheet accompanying our map).

Our map shows the ordinary trade-routes between Yunnan-fu and the Yangtse, but so great are the difficulties along all these routes, that Mr. Hosie, who has traversed them all, is forced to exclaim that if foreigners ever found their way into Sze-chuen by any one of them, he should be delighted and astonished in about equal proportions.‖ Two of these routes are partially illustrated in our section-sheet—the westernmost route by the Laowatan-Yunnan section (from 'Foreign Office Report,' Miscel. Series, No. 458, p. 53) and the Kweiyang-Chungking section (based on the data furnished by Bourne, before p. 79).

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* 'Across Chryse,' vol. ii. p. 233.

† *Proc. R.G.S.*, 1886, pp. 1–16.

‡ 'China in Transformation,' pp. 113, 119, 124.

§ Ibid., p. 114.

‖ *Proc. R.G.S.*, 1886, p. 383.

With this view Dr. Kreitner was so far agreed that he considered that many years must elapse before the construction of a line from Chengtu-fu to Yunnan-fu could be thought of. One route, however, for such a line is discussed by him, much the same as that shown in the Laowatan-Yunnan section on our sheet of sections.

The narrow rugged valley of the Yangtse above Sui-fu is, he states, altogether unsuited for the laying of a railway. The river would accordingly have to be crossed either at or above Sui-fu, preferably at Anpien, 21½ miles above Sui-fu.

At Tangaitung a serious rise begins leading up to the high plateau of Chasbang, which is crossed about Chaotung-fu. After crossing this plateau, it descends 2300 feet into the valley of the Niulan-kiang and reaches Chiang-ti. Here the Niulan-kiang, with a breadth of 100 miles, would have to be bridged. If possible, the route would then be taken up this somewhat wild and romantic valley, or across the land on its left bank in a bend to the east and south, then up other minor valleys, till with a short but steep ascent it reached the high plateau of Lungwan-miao, which it would then traverse in a southerly direction to Tungchuan-fu. It would then ascend the Tungchuan-fu river (a tributary of the Yangtse), until by another somewhat steep gradient it ascended to the plateau of Kuangtou-pu. Thence it would run over very broken ground with a sparse population till it entered on a more productive valley at Hsuentien-chau. It would then ascend the Tangtsu, cross another hill, and then, after Yanglin, accomplish the last 34 miles to Yunnan-fu across an easily traversed flat surface. The total length of the line would be about 620 miles. Equally or even more difficult is the route from Tali-fu to the fertile basin of Sze-chuen. Our section-sheet gives two sections (from Baber's 'Travels and Researches in South-Western China') of the route followed by Baber in making this journey (through the fertile valley of Kien-chang).

THE MONTHLY RECORD.

EUROPE.

Regional Geology of England.—The Cambridge University Press has recently published 'A Handbook to the Geology of Cambridgeshire,' * which presents some novel and important features. It is, we believe, the first English book in which Prof. W. M. Davis' system of the classification of rivers has been fully adopted. The introductory description of the physical geography of the region has by this means been rendered concise and systematic. While Cambridgeshire, viewed superficially, is one of the most featureless of English counties, the study of the origin of the chalk escarpment and the fenland invests its geography with a real significance, which is intensified by the full consideration of the various geological formations and their economic value. The book is written in a clear and systematic style, with abundant references to original authorities. No geological map is given, as one sheet of the new 4-miles-to-an-inch colour-printed map of the Geological Survey includes the whole district, and can be purchased at a moderate price.

Dr. Thoroddsen on the History of Iceland.—The first volume of the translation of Dr. Thoroddsen's work on the history of Icelandic geography was noticed in the *Journal*, vol. xi., 1898, p. 173; it has now been followed by a second, dealing with the history of Iceland from the beginning of the seventeenth to the middle of the eighteenth century. The fuller title now given * is more descriptive of the work, which, while geographical fundamentally, is by no means exclusively devoted to subjects that can be brought under the name of geography by the most generous stretching of its definition. The material here made available is for the most part new, inasmuch as it is published for the first time from original manuscripts preserved in various places in Iceland and Copenhagen. The volume begins with two fascinating chapters on Icelandic witchcraft and magic, then goes on to consider the views on scientific matters entertained in Iceland during the seventeenth century, with numerous biographical notices. About two-thirds of the space is taken up with detailed accounts, often containing long and interesting quotations of the early descriptions of Iceland, divided into Icelandic, Scandinavian, and other writings of the seventeenth century. The foreign descriptions of the island were too often "travellers' tales" of the most exciting kind; no wonder, natural or supernatural, was too strange to be planted in Iceland; and it is a little humiliating to find these stories, reflexes of the fancies of the fifteenth century, gravely repeated in works published in London as late as 1726. The first survey of Iceland is fully described. Prior to 1721 there existed only rough charts of principal harbours, but in that year Magnus Arason Thorchillius, himself an Icelander, was sent by the Danish government to map the island and its coasts, the Danish authorities having a very humble idea of the size of Iceland and of the cost and difficulty of the work. He laboured at his prodigious task for seven years, when he was accidentally drowned. The work, however, was continued. The first half of the eighteenth century also saw the completion of a number of remarkable local descriptions of parts of Iceland, written mainly by the clergy of the various parishes, and some of them were so well done as to retain their practical value to the present day. An account of Dr. Thoroddsen's many years' exploration in Iceland, written by himself for this *Journal*, will shortly be published, with a new map of the country.

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* 'A Handbook to the Geology of Cambridgeshire, for the Use of Students.' By F. R. Cowper Reed. Cambridge: at the University Press. 1897.

ASIA.

Dr. Futterer's Journey across Asia.—Dr. Karl Futterer, of Karlsruhe, whose journey to Kashgar was noticed in the *Journal* for June (vol. xi., 1898, p. 664), writes from Liang-chou, in the extreme east of the Chinese province of Kansu, on June 25, with further particulars of his journey across Asia. His expedition left Kashgar on February 24, 1898, and followed the route eastward through Turfan to Khami. There a camel-caravan was got together, and the journey continued in a straight line south-eastwards to Su-chou, across the mountainous part of the Gobi desert. This gave opportunities for many very interesting observations of the geological structure of the Gobi, and of desert phenomena, which throw light upon the origin of deserts. In the low-lying parts of the Gobi, at the northern and southern extremities of this section of the journey, great heat was experienced, the daily maximum of the shade temperature approaching 90° Fahr.; but on entering the higher ground in the middle, the air became much cooler, and at night the temperature fell to 14° Fahr., and on the night of May 17 a heavy snowstorm came from the north-east. The range in the temperature of the ground from the warmth during the day to the cold at night, in no less than thirteen instances during the month of May, exceeded 54° Fahr., and on one occasion, in the southern part of the desert, it was more than 76° Fahr. Su-chou was reached in thirty days from Khami, and Dr. Futterer entered Liang-chou on June 23. His plan for further work was to proceed southward through Si-ning to Koko-nor, and thence to explore the almost unknown upper valley of the Hwang-ho. The expedition will probably return to Europe early in the spring of next year.

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* Th. Thoroddsen, 'Geschichte der Isländischen Geographie. Vorstellungen von Island und seiner Natur und Untersuchungen darüber in alter und neuer Zeit.' Autorisierte Uebersetzung von August Gebhardt. Zweiter Band. Leipzig: B. G. Teubner. 1898.

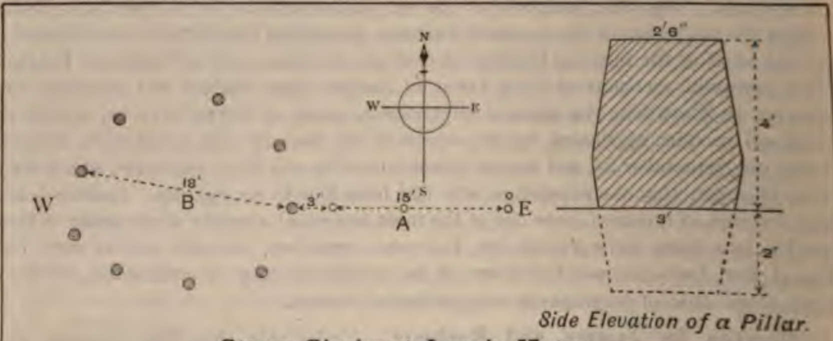
Austrian Expedition to Southern Arabia.—The Vienna Imperial Academy of Sciences has decided on the despatch of an expedition to Southern Arabia, with a special view to the exploration of the extensive ruins in the Hadramut. Count Karl Landsberg, the well-known Swedish Arabist, who, during a long residence in the South Arabian coastlands, was able to establish friendly relations with certain of the sheikhs of the interior, will assume the leadership of the expedition in association with Dr. D. H. Müller, professor of Semitic languages at the University of Vienna. The other members of the expedition will be Dr. Alfred Zahn, Prof. Oskar Simony (son of the deceased Austrian geographer), and Dr. Franz Kossmat, of the staff of the Imperial Institute of Geology, a former pupil of Suess and Penck. The personal exertions of King Oscar of Sweden have enabled the Academy to charter in Stockholm the steamer *Gottfried*, a vessel of 600 to 700 tons, equipped with all modern appliances, for the objects of the journey. It sailed from Stockholm on September 28, and was to proceed to Aden *viâ* Hull, Gibraltar, and Suez. It is thought that the expedition will last from four to six months. Inasmuch as the district in question, once one of the most important emporia of the trade of the world, has been little visited by European travellers, valuable results may be hoped for from the point of view of the ancient history of civilization, no less than from that of geographical and geological science.

Routes in Jammu and Kashmir.—Under this title, Major-General de Bourbel, late chief engineer of the Jammu and Kashmir state, has recently published a work which should be of much practical use to travellers in that region (Calcutta: Thacker, Spink & Co.). It gives statistics, in tabulated form, of a large number of routes in Kashmir and Jammu, mentioning the length of the stages, general nature of the route, chief physical features passed, and the availability or otherwise of supplies, grazing, transport, etc. Although in the main merely a compilation from the works and maps of other travellers, the author has drawn on his personal knowledge for some part of the information, and for the means of checking that obtained elsewhere. The routes are arranged in five groups, radiating from the centres Jammu, Panch, Srinagar, Gilgit, and Leh, the chief towns of some of the most important provinces in the Maharaja's dominions.

AFRICA.

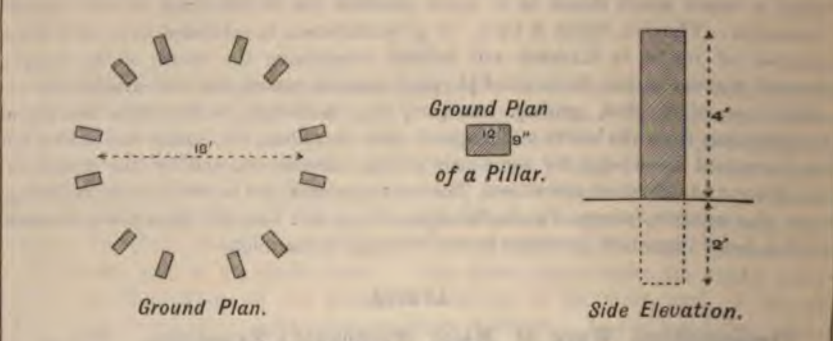
Geographical Work of Major Macdonald's Expedition.—Writing in July last from Save (north of Mount Elgon), on the eve of his departure northwards, Major Macdonald gives us some further information (cf. *Journal*, vol. xi. p. 548) as to the geographical work done by members of his expedition. The principal result so far has been the discovery that the Lake Ibrahim marked on our maps as an expansion of the Victoria Nile does not exist, and that Lake Kioja extends much further eastward than has been supposed. The broad lower reaches of the Sesiwa are the only feature that could have been taken for the former lake, and it is possible that the native use of the word "Nyanza," as applied to the Nile, may account for its previous insertion. Lake Kioja (explored by Captains Kirkpatrick and McLoughlin) extends between 50 and 60 miles east, with an average width of about 10 miles, though there are long extensions in the form of bays, one of which stretches 20 miles to the south-east. There are regular lake-dwellers living both in pile houses and on islands. Major Macdonald's route from Mumia's to Save led west of Elgon, and mainly west of Hobley's route. This has enabled him to ascertain the nature of the drainage from Elgon towards the Nile, and to map Lake Salisbury and the small lakes near it more accurately than had been hitherto done. We are not told, however, whether or not these are drained towards Lake Kioja, as has been hitherto supposed.

Sacred Stones in West Africa.—Captain J. W. Maxwell Carroll sends us some details, accompanied by sketches and a photograph, respecting the interesting discovery of ancient stone circles, etc., made by him in the neighbourhood of Lamin Koto, on the right bank of the upper Gambia. Those at that place are in particularly good preservation, and are also still looked upon with respect by the natives, whilst elsewhere they are, as a rule, disregarded. Prayers are offered in their vicinity on feast days during Ramadan by the Almame, or high priest, and it is believed that all prayers offered up within the enclosure formed by the stones are granted. In the accompanying diagram, A denotes the spot occupied by the priest, the people standing at B. The origin of the pillars is quite unknown, and the present inhabitants have not the means either of transporting or working on them. The diameter of the circle is 18 feet, and all the measurements are multiples of 3, while, curiously enough, 1 foot may be taken almost exactly as the unit.



Side Elevation of a Pillar.

Stone Circle at Lamin Koto.



Ground Plan of a Pillar.

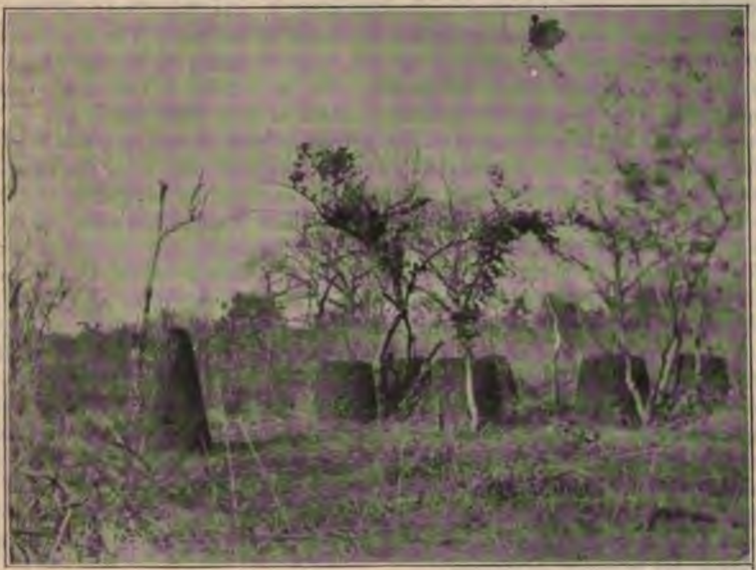
Ground Plan.

Side Elevation.

Stone Circle at Chamen.

Walker & Boutall sc.

In the pagan country of Niani Bantang the stones were quite unheeded, and were only discovered by accident hidden in the long grass and brush. At Chamen the pillars were arranged in pairs instead of singly, and their section was rectangular, not circular; but the diameter of the circle and the height of the stones (6 feet) remained constant. At Palellan a stone circle was found in use, with the help of poles, for stacking grain, whilst isolated stones seen elsewhere seemed to show that some had been removed. On a hill commanding a magnificent view of the surrounding country, a huge rectangular stone, 12 feet by 4, was found. Its height was 6 feet at one end and 4 at the other, and its shape suggested that it had been used as a sacrificial altar.



SACRED STONES ON THE GAMBIA.

M. Gentil's Exploration of the Shari.—A connected narrative of M. Gentil's expedition, respecting which we have already given some details, appears in the September number of the *Bulletin de l'Afrique Française*. As is well known, the French explorer ascended the Mobangi to its most northerly bend, and then struck northwards up the Kemo, a small northern tributary. Crossing over to the Tomi, also a feeder of the Mobangi, M. Gentil ascended this stream to the limit of navigation, where the post of Krebeje was established. After some negotiation with the Manjias, the warlike tribe which opposed M. Maistre's expedition, he was able (September 18, 1896) to reach the Nana, belonging to the Shari basin, and sent on MM. Hunzbuchler and Prins to reconnoitre its course. Below a series of rapids discovered by them, which extended over 5 miles, with a total fall of 300 feet, a station was founded, and the *Léon Blot*, the steamer intended for the navigation of the Shari, was successfully launched early in 1897. At the junction of the Nana with the Gribiñgi some delay occurred, owing to the suspicious attitude of the Senussi Mussulmans, but these were in time propitiated, and in August, 1897, the voyage was resumed. The Gribingi was at first so narrow that the overhanging branches impeded navigation, but it soon widened to over 60 yards, and the steamer proceeded at a rapid pace. In lat. 8° 30′ three rapids were met with, but they are easily passed at high water. The country is well peopled, though the immediate banks of the stream are uninhabited, owing to the inundations. On August 20 the expedition reached a river 200 yards wide, known to the natives as Bamingi, which is the principal branch of the Shari. According to a map given with the narrative, it was this river, and not the Gribingi, which was reached by Dybowski further to the east. The confluence of the Gribingi is in 8° 35′, and in 8° 42′ the Shari is joined on the right bank by an important stream called Bangorran. On September 3 the river became encumbered with islands, and attained a width of over 4000 yards, and on the same day the territory of the Niellims, a tribe subject to Bagirmi, was reached. The country was well cultivated, but was only then recovering from the effects of Rabah's passage five years before. M. Gentil received an invitation from the Sultan of Bagirmi to visit him at Massenya, which it seems has again taken its place as the capital; it still shows the results of its destruction by the troops of Wadai in 1870, but its houses are being rebuilt. M. Gentil arrived by the Bahr-el Guir, which is the Ba Bachikam of Nachtigal; this is spoken of as an affluent of the Shari, and it is not stated whether it is a divergent branch of the main river as hitherto supposed and as shown on the map. The Bahr es Salamat, or its continuation west of Lake Iro, is shown on the latter as joining the main Shari—in about 10° 10′ N.—and not the Ba Bachikam, as thought by Nachtigal. Quitting Bagirmi, Rabah's dominions were soon reached, and the mouth of the Logone, a magnificent stream with a strong current, was passed. Below this the Shari divides into three important branches. Only a short stay at Lake Chad could be made, on account of the enmity of Rabah. On the return to Bagirmi, M. Prins was left at Massenya as French resident, while two envoys from the sultan accompanied M. Gentil to France.

Major Marchand's Expedition.—Some details respecting the inception and early stages of this expedition were given in the *Journal* for February last (vol. xi. p. 170). From Tambura, where a French post had been established by M. Liotard early in 1896, Major Marchand and his officers appear to have proceeded northwards by various routes, the expedition being, however, again united at Fort Desaix, a post established at the junction of the Sue or Jur with the Wau. Other posts had been founded *en route* on the upper Sue as well as on the Wau and Tonj. The boats which had been transported with endless trouble from the Mobangi were launched on the Sue, and the last part of the route was performed by water, *viâ* the old Egyptian river-port Meshra-er-Rek. For details respecting the voyage to Fashoda, the publication of Major Marchand's report must, however, be awaited. The chief authority on the region of the Bahr-el-Ghazal traversed by the French expedition is, of course, Dr. Junker, who in the second and third volumes of his 'Travels in Africa' described his extensive journeys in that region between 1879 and 1886. A condensed account of those journeys appeared in the *R.G.S. Proceedings* for 1887, accompanied by a map. The complete results of his surveys were published as supplementary numbers of *Petermanns Mitteilungen* (Nos. 92, 93, 1889), the maps being drawn on the large scale of 1 : 750,000. Information respecting the Bahr-el-Ghazal province under Egyptian rule is also to be found in Schweinfurth's 'Heart of Africa,' Gessi's 'Seven Years in the Soudan,' and in a paper describing Lupton Bey's explorations, read before the R.G.S. in 1884 (*Proceedings*, 1884, p. 245). A useful sketch of the history of the Egyptian Sudan is given by Herr Frobenius in his work 'Die Heiden-Neger des ägyptischen Sudan' (1893). It may be observed that Fashoda was an Egyptian post so far back as

1867, and that it remained throughout independent of the Bahr-el-Ghazal province, being the residence of a mudir directly subordinate to the Government at Khartum.

New Determination of the Height of Mount Cameroons.—In the latest issue of the *Mittheilungen aus den Deutschen Schutzgebieten*, Baron von Danckelmann has a short note on the recent determination of the height of Mount Cameroons by Dr. Preuss, who ascended the mountain in March, 1898. The determination was made by boiling-point thermometer, and as simultaneous observations of atmospheric pressure were carried out at sea-level at the government station at the Cameroons, while the corrections for the thermometer employed were known with some accuracy, Baron von Danckelmann considers that the figure obtained merits greater confidence than those of previous observers, which, he says, rest on no secure basis. Dr. Preuss considers the Fako peak to be the highest summit of the mountain, and his altitude for this is 13,370 feet, as compared with 13,760 of the English Admiralty chart (derived from Captain Owen's surveys), 13,129 of Burton, and 13,508 of Johnston. The differences may, Dr. von Danckelmann thinks, be partially accounted for by the fact that all the measurements do not refer to the same summit, some apparently being made for the Victoria peak, which, according to Burton, is somewhat lower than the Albert peak, this seeming to correspond with the "Fako" of Dr. Preuss. Considering the methods employed, however, the divergences can hardly be considered excessive.

Domestication of the African Elephant.—M. P. Bourdarie, who has lately returned from a government mission to the French Congo, is a firm believer in the possibility of the domestication of the African elephant, and an advocate of experiments in that direction. Writing to the *Politique Coloniale* of October 8, he calls attention to the fact that an African elephant has during the past year been regularly employed at the Fernan Vaz mission for purposes of transport. It was captured by the Pahuins and purchased by Père Bichet, who succeeded in training it without the aid of Indian elephants. Although only four years old, it makes the journey from the mission to the forest—a distance of 2 miles—eight times a day, and transports loads of 1800 to over 2000 lbs. by the means of a wheeled vehicle. It finds its own food in the jungle, and can be driven by two native boys. When proceeding to the Congo during the summer, M. Bourdarie took with him a large number of Wardian cases of india-rubber and gutta-percha plants (Isonandras, Heveas, and Castilloas) for introduction into the French colony.

AMERICA.

Sir Martin Conway in the Andes.—The *Daily Chronicle* publishes a telegram from La Paz, announcing the results of Sir Martin Conway's attempted ascent of Mount Sorata. A camp was established at a height of 20,000 feet in September, but bad weather necessitated its temporary abandonment. On October 9 a return was made to the camp, and on the 10th the party proceeded up an excessively steep slope of rotten snow, until a point was reached just below the summit, further progress being then stopped by an impassable crevasse. The highest point reached was, Sir Martin Conway thinks, between 23,000 and 24,000 feet. Should this prove the case, the mountain will be considerably higher than has been supposed, and the old idea that it is the highest summit of the Andes may very possibly be justified. During the ascent the thermometer sank to 2° Fahr., or 30° of frost, and both the guides suffered from frost-bite. A second attempt to reach the actual summit proved equally unsuccessful.

AUSTRALASIA AND POLYNESIA.

Islands and Coral Reefs in the Fiji Group.—The *American Journal of Science* (vol. v. No. 26) contains a series of extracts from a letter addressed by Dr.

Alexander Agassiz to E. S. Dana, dated from Suva, in the Fiji islands, and giving a preliminary account of a six-weeks cruise amongst the islands on board the s.s. *Yaralla*, a twin-screw steamer chartered from the Australasian United Steam Navigation Company. The *Yaralla* was fully equipped with apparatus for deep-sea investigation, and boring machinery was landed and set up at Wailangalala. From the geological examination of the whole region, Dr. Agassiz is now of opinion that boring through the coral rock of this region can give no information on the main question of coral formation. He says, "I came to Fiji under the impression that we were to visit a characteristic area of subsidence; for according to Dana and Darwin there is no coral reef region in which it is a simpler matter to follow the various steps of the subsidence which has taken place here. . . . My surprise was great, therefore, to find within a mile from Suva an elevated reef about 50 feet thick and 120 feet above the level of the sea, the base of the reef being underlaid by what is locally called soapstone, probably a kind of stratified volcanic mud." Traces of elevation in different localities are remarked on; and Dr. Agassiz proceeds, "All this plainly shows that the southern part of Viti Levu and as far south as Vatu Leile, and the whole length of the Windward islands of the Fiji group from Ngele Levu on the north to Ongea on the south, have been subject to an elevation of at least 800 feet; as there is abundant proof that a great part of the thickness of the elevated reef has been eroded to reduce it in certain localities to the level of the sea or to leave at others bluffs and islands or islets, the occurrence of which we have traced at so many points. . . . I am inclined to think that the corals of to-day have actually played no part in the shaping of the circular or irregular atolls scattered among the Fiji islands; furthermore, that they have had nothing to do in our time with the building up of the barrier reefs surrounding, either wholly or in part, some of the islands. I also believe that their modifying influence has been entirely limited in the present epoch to the formation of fringing reefs, and that the recent corals living upon the reefs either of the atolls or of the barriers form only a crust of very moderate thickness upon the underlying base. The base may be either a flat of an eroded elevated reef or of a similar substructure of volcanic rocks, the nature of that base depending absolutely upon its character when elevated in a former period to a greater height than it now occupies." Dr. Agassiz is unable to state the age of the elevated reef of the Fiji, or to decide whether the date of elevation coincided with that of northern Queensland. He discusses observations on the formation of atolls on the eroded summits of extinct craters, and points out that the great depth of the lagoons of some of the atolls can no longer be considered as a proof of the theory of subsidence. The general conclusion is to emphasize the fact that it is impossible to assign any one factor as the single cause for the formation of the many different kinds of atolls and barrier-reef islands to be found in the Fiji group.

British Annexation in the Pacific.—The British Protectorate over the Southern Solomon Islands has this year been extended by the hoisting of the British flag over the islands of the Santa Cruz and other small groups to the north of the New Hebrides. This was done by H.M.S. *Mohawk*, which left Sydney for that purpose in April last. The Santa Cruz group is celebrated in history as the scene of the death of the Spanish navigator Mendaña, and of the disastrous termination of La Pérouse's expedition. Some account was given in the *Journal of the R.G.S.* for 1872, by Admiral (then Lieut.) A. H. Markham, the paper being accompanied by a map. During the cruise of the *Mohawk*, a volcanic peak was observed to be partially active.

POLAR REGIONS.

Antarctic Icebergs and Shipping Routes.—The following letter, dated September 6, 1898, on this subject from Mr. H. C. Russell, C.M.G., the government astronomer of New South Wales, has been forwarded by the secretary of the Shipmasters' Society: "In answer to your question, 'How is it that the Indian Ocean field of icebergs is confined between the meridian 40° and 90° E., and between the parallels 40° and 50° S.?' I may say that I think the number of ships passing through that region in the so-called safety track tends to make the number of *reported* icebergs greater than it is in regions north and south of it, where few vessels pass. And also in part it is probably due to the antarctic current, which sets northwards about the Crozets, and the return warm current, which sets to south near Kerguelen, and it would appear that this limitation of the field is only recent. For my first paper shows them from 20° E. to 60° E., and Towson places them 50° W. to 90° E. I think these reports are too condensed. We want the icebergs for each month and each year plotted each on a separate chart, with currents, winds, and weather shown, and then a careful study of the whole would, I feel sure, help us very materially in grasping the whole difficulty of the *iceberg*; and my pet scheme, were the money available, would be to send a party of competent observers in a suitable steamer to go amongst the icebergs in latitudes used for commerce, and study them for say six or eight months."

Captain Sverdrup's Polar Expedition.—From a correspondent on board the *Fram*, the *Times* has received details (despatched from Godhavn on July 30) regarding the voyage across the Atlantic and up the west coast of Greenland to that point. During the passage across the Atlantic a continuous head wind was experienced, which drove the *Fram* up under the Færoes and Iceland. Stormy weather was also encountered, and the ship rolled violently. On July 19, in the neighbourhood of Cape Farewell, the *Fram* got into the ice, which this summer was brought down in great masses by the arctic current, and it was two days before the ship was clear. On the west coast of Greenland the effect of the current reached an unusually high latitude, and the prediction of a favourable season for the navigation of Davis strait was not verified. The approach to Sukkertoppen was completely blocked by ice, but the ship succeeded in calling at Egedesminde, where thirty-six dogs were taken on board. More were to be embarked at Godhavn and Upernivik, whence the course was to be shaped for Cape York. Meteorological and other observations were commenced early on the voyage, and several "floaters," or receptacles for messages, had been thrown overboard before reaching the neighbourhood of Cape Farewell.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Distribution of Oceans and Continents.—At the Bristol meeting of the British Association, Dr. J. W. Gregory read a paper on the theories of the distribution of the oceans and continents on the Earth's surface. He pointed out that the main object of geomorphology is to explain the existing distribution of land and water on the globe. A remarkable series of coincidences in the form and arrangement of the land masses suggests that the distribution has been determined by some general principle and not by local accidents. The three most striking features that require explanation are the antipodal position of oceans and continents, the triangular shape of the geographical units, and the excess of water in the southern hemisphere. Attempts to explain this arrangement have been made deductively from general physical considerations, by Elié de Beaumont, Lowthian Green, and G. H. Darwin; and directly from the evidence of stratigraphical geology, by

Suess, Lapworth, and Michel-Levy. Thus Elié de Beaumont regarded the form of the continents as determined by the mountain chains, which he correlated into a regular geometrical network; while Lapworth regarded the distribution of land and water as due to a series of great Earth-folds, the arches forming the continents and the troughs forming the ocean basins. Suess has treated the subject synthetically; he has shown that the structure of the world can be explained by subsidences in the crust when subterranean support is removed by the shrinkage of the internal nucleus, and by the movements of elevation which produce the chains of fold-mountains. Suess's view explains the structure of the continents and ocean basins, but not their arrangement. To settle this problem fuller knowledge is needed as to the distribution of land and water in past times. Neumayer's attempt to settle this question for the Jurassic was premature, and his conclusions are untenable. We are thus still dependent upon the deductive systems for suggestions as to the most profitable lines of research. Elié de Beaumont's famous scheme attached undue importance to linear symmetry, and was too artificial. It led, however, to the tetrahedral theory of Lowthian Green, which regards the world, not as shaped like a simple tetrahedron, but as a spheroid slightly flattened on four faces. Such flattenings occur on hollow spherical shells when they are deformed by uniformly distributed external pressure. The oceans would occupy the four depressions thus produced, and the land masses occur at the angles and along the edges. The existing geographical arrangement is in general agreement with this scheme; for, as the tetrahedron is hemihedral, the assumption that the lithosphere is tetrahedral explains the antipodal position of land and water, the excess of water in the southern hemisphere, and the southward tapering of the land masses. The main lines of the existing system of fold-mountains have a general agreement with the arrangement of the edges of a tetrahedron. Some striking deviations occur, but are explicable by the variations in the composition of the lithosphere, and the existence of impassive blocks of old strata which have moulded the latter movements. The lines of the old fold-mountains of the Hercynian system may have been tetrahedrally arranged, with the axes occupying different positions from those of the great Cainozoic mountain system. So far, however, there is no completely satisfactory theory of geomorphology, for which we must wait for further information as to the distribution of land and water in successive epochs of the world's history; for the historical method promises more reliable results than the deductive method.

GENERAL.

Memoir of Sir Henry Rawlinson.—The full obituary notice of the late Sir Henry Rawlinson, which appeared in the *Journal* shortly after his death (vol. v., 1895, p. 490), set forth the leading facts of his remarkable career, and dwelt specially upon his long association with the Royal Geographical Society, and the many services he rendered to it. The Memoir* which has recently been published deserves special notice, however, on account of the unusual interest of the life it describes, and the high position of its subject in the geographical, as well as in the military, political, and scholarly worlds. That a life of such length and continuous activity, crowded with incident and adventure as it was, and involving the whole history of some branches of knowledge, *e.g.* the cuneiform records, should be described in one compact volume is a guarantee that the book contains nothing superfluous, and it certainly contains nothing dull. The concluding chapter summarizes Sir Henry Rawlinson's position and work as a geographer. His geographical labours commenced in 1836, and continued throughout his long life, and the appreciations of a succession of presidents of the Society are quoted in support of the claim that Sir Henry Rawlinson possessed in unusual, indeed in a unique, degree the qualities of a geographer in the fullest sense of that word. Instances are happily not few in which recondite sciences have been advanced by the leisure studies of British officers in the field, but there are not many who have given so splendid a demonstration of the combination of military ardour and scientific enthusiasm.

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* 'A Memoir of Major-General Sir Henry Creswicke Rawlinson, Bart., etc.' By George Rawlinson, M.A., Canon of Canterbury. With an Introduction by Field-Marshal Lord Roberts, of Kandahar. London: Longmans, Green & Co. 1898.

An Illustrated School Geography.[*]—Dr. Herbertson has prepared, on the basis of Frye's 'Complete Geography' (see *Journal*, vol. vii., 1895, p. 571), and in the same large quarto form, a school-book of a type not hitherto attempted in this country. It has been adapted for British needs by rewriting the section on the United Kingdom and the United States, greatly extending the former, and considerably reducing the latter. The rest of the book is also so much modified that the whole letterpress may be taken as new, only the series of beautiful illustrations has been taken over from the American book without alteration, except for the addition of some characteristic views of the British Islands. A set of coloured maps by Bartholomew, occupying sixteen pages, makes an atlas unnecessary, and, taking this into consideration, the book is remarkably cheap. It remains to be seen whether this form will prove popular; but if it fails to please, it will be on account of the form alone. The contents are well chosen, and the style is adapted to the requirements of young scholars. With the exception of one or two half-tone illustrations, which compare unfavourably with the woodcuts, the whole get-up of the book is satisfactory, in no way behind the best American work.

An American School-book.—The 'Natural Advanced Geography,' by Messrs. Redway and Hinman,[†] is deserving of notice as the most remarkable of recent American school geographies. It shows all the good points of this type of book advanced to a surprising excellence, but most of the unsatisfactory features of the type are perpetuated, though rendered much less conspicuous than has formerly been the case. The introductory part dealing with the principles of geography is put together with much discrimination, and embodies the best of many earlier text-books, American and British. The description of the United States leaves little to be desired, and the illustrations are very fine, really illustrating the text, whether in the form of pictures, statistical diagrams, or maps. So far the book is a solid gain to educational literature. But the few pages which dismiss the rest of America and the whole eastern hemisphere cannot fail to give a most erroneous impression to the United States scholars. The idea indicated in the general section that all monarchs were originally tyrants, and the implication that a limited monarchy is at best a mitigated evil, shows disregard of history; the duties of a sovereign, and the fact that in certain stages of civilization a land without a leader was doomed to disappear, are not touched on. In the limited space assigned to other countries, it is simply impossible to convey correct impressions of them, and it might be better to restrict the study of geography to the home-country altogether. It is by no means unlikely that the recent trend of events in the United States will lead to a real demand for school-teaching regarding other lands, and, while it would be most unfortunate to treat the home-country in less detail, it might well be so viewed as to obscure a little less of the great world than it does in the American school-books of to-day.

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[*] 'An Illustrated School Geography.' By Andrew J. Herbertson. Partly based on Frye's 'Complete Geography.' London: Edward Arnold. 1898.

[†] 'Natural Advanced Geography.' By Jacques W. Redway, F.R.G.S., and Russell Hinman. New York, Cincinnati, Chicago: The American Book Company. [1898.]

OBITUARY.

Lieutenant-Colonel H. L. Wells, R.E., C.I.E.

By Major-General Sir Frederic J. Goldsmid, K.C.S.I., C.B.

The sad and quite unexpected death of Colonel Henry Lake Wells, at the comparatively early age of forty-eight, has not only thrown a gloom over Karachi, the scene of its occurrence, but also over the Department to which he belonged, and to which he had rendered such valuable aid during a long residence in the Shah's dominions. But before his appointment to Tehran in 1880, as an Assistant-director of the Telegraph, he had earned an honourable record, the nature of which may be shown in the following brief official summary.

Born on March 8, 1850, and receiving his commission as lieutenant of Engineers in 1871, young Wells, after special employment for more than one year in the office of the Inspector-General of Fortifications at the Horse Guards, qualified as Instructor in Army Signalling, and embarked for India, arriving in that country on December 18, 1875. Here his services were soon placed at the disposal of the commander-in-chief, and he became attached for a time to the Afghan Field Force. From January, 1878, to November, 1879, while an executive engineer, 3rd grade, in the Public Works Department, he was in sole charge at Quetta, where he had built the native cantonments; and we learn incidentally from the pages of Major Le Messurier's 'Kandahár in 1879,' as well as by the official statement, that the Ghilzai labourers who constructed the road across the Khojak worked under his superintendence. It should be noted, moreover, that before his transfer to Persia in 1880, with the higher rank of captain, he was employed on special duty in the Indian Telegraph, to survey and report upon routes in Kashmir and Gilgit, for a line of wire communication proposed to be established between Srinagar and the latter place.

For the eighteen years which passed since the deceased officer joined his countrymen in Persia, the official record bears ample testimony to his energy and usefulness. In the first instance, assistant-director, and for a short time officiating director, of a Department known as the "Government Indo-European Telegraph," he was appointed to officiate as director of the Persian Section on return from leave to England in 1885. During the many years spent in the fulfilment of these duties, some estimate of the character as well as value of his work may be gathered from the frequent attestations of the several authorities with whom he came in contact. Independently of the recorded acknowledgments of his own director-in-chief, the Director-General of Telegraph in India, the Government of India, and the directors of the Indo-European Telegraph Company, he received the thanks, for assistance afforded on special occasions, of Her Majesty's Commissioner for the delimitation of the Afghan frontier, in 1886; of the Director of Army Remount operations for India, in 1887; and of the French Consulate at Bushire and our own Political Resident in the Persian gulf, in 1890. We further take particular note of not only the recorded approval, but the grant of a sword of honour on the part of H.I.M. the Shah; a vote of thanks by the Board of Directors Indo-European Telegraph Company, "for admirable spirit and example set during the cholera epidemic of 1893;" and, finally, the thanks of the Secretary of State "for arrangements made during the revolution that took place at Shiraz in May, 1893."

Captain Wells received the local rank of major in March, 1885, having previously qualified for such promotion, and obtained, about the same time, a certificate of distinction in Military Law. When substantive major, he was also granted the local rank of lieut.-colonel, for which he subsequently passed the required examination. As regards linguistic qualifications, he passed the higher standard of examination in Persian so far back as May, 1883. His war services include the Afghan campaign of 1878–80; the raising a corps of Ghilzais, to which allusion has already been made; an engagement near the Khojak, in which he commanded detachments of Panjab cavalry and Sind horse, and was wounded; accompanying the leading column of General Biddulph's force down the Thal Chotiali route; the action at Baghao; service with the Khaibar line force in 1879–80; the action of Mazina, where he was present as General Gib's orderly officer; and having charge of pontoons at the crossing of the Kabul river. Publicly thanked in the *London Gazette*, November 7, 1879, and later on in the *Gazette of India*, May 27 and August 14, 1880, he was mentioned in General Biddulph's despatches, dated May 18, 1879, for the skill displayed in making the road over the Khojak, and in General Doran's despatches, dated June 18, 1880, as having done "admirable service." The *Army and Navy Gazette*, in notifying that he took up his appointment as Director of the Gulf Section of the Government Telegraph on September 1 ult., and had received the C.I.E. from Her Majesty at Windsor in the previous July, adds, "The loss of this distinguished officer is greatly deplored, for a bright future seemed to be before him after all the good work he had done. To be mentioned in despatches on five occasions, three of which were for services rendered in action, was no mean record for a subaltern officer, detached for a brief period beyond the north-west frontier of India."

As the author of professional and geographical papers for Government, or departments of Government, or published by the Institute of Royal Engineers, or in the journals of a learned society, Colonel Wells received, on more than one occasion, the thanks of H.M. Secretary of State for Foreign Affairs for information supplied. Among his papers contributed to the *Journal* of the Royal Geographical Society (of which he had become a Fellow in 1880), those contained in vol. v., New Series, are of considerable importance, and throw much light on the lines of communication in Southern and South-Western Persia. In alluding to this subject in the course of his Annual Address for 1882–83, our then President, the late Lord Aberdare, spoke of the series of route-maps sketched out by Captain Wells, as adding "materially to our knowledge of this part of Persia." The late Sir John Bateman-Champain, R.E., on the same occasion, referred to the carefully surveyed plan of the rocks which impede the course of the Karun river, by which Captain Wells, and those whose knowledge of the country was obtained from that officer's reports, could form a conclusion on the better course to be adopted to meet the difficulties which had to be overcome. The above-mentioned officer, then Director-in-chief of the Indo-European Telegraph Department, alluded also to notes and plane-table surveys of several routes explored by Wells between Dizful and Shiraz, which he thought would "prove of great utility to future travellers." At the reading of one of Captain Wells's papers a few years ago before the Society of Arts, the present writer had the honour of presiding.

It must not be inferred that, as a rule, employment in the Persian telegraph—from the days of its early and quasi "non-regulation" system of procedure up to its regularization on "up-to-date" principles—offered any special advantages to the young engineer officer. But the new field was interesting, and it was only fair to suppose that the early pioneers of Indo-European telegraphic communication would be duly rewarded for their labours, should the end, then so urgently sought for by merchants and politicians, be satisfactorily attained, and that they would not suffer in position owing to absence from India or the natural sphere of their duties elsewhere. Whether such hopes have been fulfilled or not, it is hardly our province to inquire. Moreover, death has removed many distinguished members of the Persian Telegraph Mission in the zenith of their respective careers—honest, high-minded labourers, such as Patrick Stewart, Bateman-Champain, Oliver St. John, William Henry Pierson—men who, like their brother engineers in the Palestine Exploration Fund, have made an honourable reputation for themselves in a special sphere of their own. Last on the list is Henry Lake Wells, who joined the establishment some eighteen years ago. Be it understood, however, that no statement of good service performed by the Royal Engineers in Persia would be complete without recognition of the able and zealous non-commissioned staff who worked so zealously for their chiefs during the last thirty-seven years.]

Colonel Wells was taken ill at Karachi on August 25, having only arrived there from England on the first day of that month. On the night of the 31st he died. The doctors found that a touch of the sun may have combined with enteric fever to aggravate his sickness. Of the loss sustained in the domestic circle, it is difficult to speak so soon after the event. The blow has been both sudden and heavy; but though sympathy is only perhaps a poor palliative, it will assuredly be genuine in the present case.

Henry Wells was the son of the late Rev. T. B. Wells, Rector of Portsmouth, Devon, who served in the navy in his younger days, and fought at Algiers in 1816, when midshipman of the *Granicus*. A brother, Lieut. Lewis Fortescue Wells, greatly distinguished himself during the Ashanti war of 1873, and was mentioned several times in despatches. He led fifty seamen and marines on to the flank of a large Ashanti force attacking the castle at Elmina, and was thanked on the field by his commanding officer. For this service he was appointed to H.M. Yacht *Victoria and Albert*, but died of yellow fever on the homeward voyage.

It is only right that the following testimony, spontaneously tendered by the Director-in-chief of the Department to which Colonel Wells was attached, should here be added: "I have been working with him for years, and I certainly have never met a more honourable man. . . . He was most careful in preventing any unnecessary expenditure of Government money, and through his careful watchfulness of the traffic, he helped to maintain the Indo-European telegraph route, as the most accurate and most rapid communication with India and the Far East."

The Right Hon. Sir George Grey, K.C.B.

The veteran colonial statesman who has recently passed away from among us was one of our oldest members, having joined our Society in 1837, or only seven years after its foundation. Sir George Grey, whose name will always be prominently connected with the history of our colonies in the Southern hemisphere, was at the same time a contributor to the cause of geographical science, although his services in this direction were eventually eclipsed by his work in a wider sphere. It was, in fact, as an explorer that his name first came before the public in connection with the Australian colonies, in which so much of his after-life was spent. Born in 1812, and educated for the military profession, he obtained a commission in 1830, and served for a time in the west of Ireland; but in 1837, his attention having been directed to the Australian colonies as a home for our surplus population, he put forward a proposal for an exploring expedition in the north-west of the island continent. His ideas were taken up by the Royal Geographical Society, and the influence of the President was exerted to obtain a grant from the Colonial Office for the proposed expedition. In spite of great difficulties and hardships, some valuable work was done, and after the publication, in 1841, of a narrative of his journeys, he received from Lord John Russell the important appointment of Governor of South

Australia. This was the beginning of a long period of colonial administration, during which he rendered incalculable services to colonies struggling with difficulties of all kinds. As Governor of New Zealand, in 1845, he promptly repressed the Maori insurrection, and advanced the prosperity of the colony by wise measures of internal administration. After a visit to England, he was, in 1854, appointed to the Government of the Cape, then passing through an unusually stormy period, and again proved his genius for rule by the suppression of the Kaffir rebellion, by the improvement of relations with the Hottentots and Boers, and by the initiation of public works essential to the prosperity of the country. Again called to New Zealand in 1861, he marked his second governorship by the pacification of the Maoris and the establishment of permanent friendly relations between them and the whites. After a visit to England, followed by some years spent in retirement at his island home at Kawau, he became a member of the New Zealand parliament in 1875, and took an active part in the political affairs of the colony, becoming premier in 1877. His policy was marked, as always, by strong democratic leanings. In 1890 he again retired to Kawau, and five years later came to England, where the last three years of his life were spent. He had served on the Council of our Society in 1869–70.

Colonel Don Francisco Coello de Portugal y Quesada (President of the Spanish Geographical Society).

By Sir Clements R. Markham, K.C.B., F.R.S.

Our respected associate, Don Francisco Coello, died on the 30th of last September. He had been an Honorary Corresponding Member of our Society since 1850, a period of nearly half a century, and had frequently rendered us valuable assistance in advising us respecting and in transmitting to us geographical publications. He was appointed Spanish delegate to the International Geographical Congress in 1895, but was unable, through ill health, to come to this country.

Colonel Coello left the military academy in 1839, and, entering the Spanish Corps of Engineers, became a captain in 1844, and colonel in 1865. As a geographer he was zealous and indefatigable, the most important result of his labours being the Atlas of Spain and her Colonies. Among his other works was a memoir on the towns, roads, and ancient ruins of the province of Alava. Coello was one of the founders of the Spanish Geographical Society, and its chief supporter, being perpetual President. Our venerable colleague was a learned geographer, a man of simple habits, an untiring worker, and a high-minded gentleman. He had been decorated by his own Government with the Grand Cross of Military Merit; and had received recognitions from other governments, as well as from numerous scientific societies. Don Francisco Coello leaves a widow and two children. We offer to his family, and to his colleagues at Madrid, our warm sympathy for the great loss they have sustained.

Dr. Don Luis Carranza.

A letter has been received from Dr. Don Ricardo Florez, Vice-President of the Lima Geographical Society, announcing the lamented death of its President, our Honorary Corresponding Member, Dr. Don Luis Carranza, on July 28 last. The Peruvian society was founded in 1888, and Dr. Carranza, who was a Senator and Councillor of State, had been its President since 1890. Besides conducting the administrative work of the society with great zeal and distinguished ability, Dr. Carranza has contributed numerous valuable papers to the *Boletin*, and has submitted annual memoirs on the progress of geographical work in Peru to the members of the society of which he was President. Dr. Florez truly says, in his letter, that Dr. Carranza's lamented death leaves a blank which it will be very difficult to fill.

Cesare Pomba.

We regret to record the death of Cavaliere Cesare Pomba, an Italian geographer of some note. Born in 1830, and thoroughly grounded both in mathematical and literary studies, he devoted himself especially to geography, without, however, withdrawing himself from practical affairs. He took much interest in agriculture, and was connected with the municipal government of his native city of Chieri. To geographers he is best known for his relief map of Italy, constructed after his own ideas in such a way that the curvature of the earth was duly shown, while the true proportion between the vertical and horizontal scales was preserved. Signor Pomba attended the meeting of the International Geographical Congress in London in 1895, in connection with which he published a brochure, setting forth the principle of his relief map. His kindly disposition prompted him to many acts of courtesy to foreign geographers visiting Italy.

Max Ritter von Proskowetz.

The death, through an accident, of the Chevalier von Proskowetz, Austrian Consul at Chicago, has lately been announced. The deceased, who joined our Society in 1890, was the son of Emanuel von Proskowetz, of Kwassitz, Moravia. In 1888, after the opening of the Samarkand railway, he carried out a long-meditated journey through the Russian territory in Central Asia, subsequently giving an account of the same to the public in his work 'Von Nevastrand nach Samarkand,' to which Prof. Vambéry contributed an introduction. The object of his journey was to examine for himself the progress of Russian civilization in Asia, and, being a careful observer, he brought back information of considerable value as regards the economic, commercial, and industrial conditions in the countries traversed.

CORRESPONDENCE.

Lake Boanensis.

A False Reading in Evagrius ii. 14.

The two editors of the forthcoming volume of Evagrius (which is to be the first instalment of Mr. Methuen's reissue of Byzantine Texts under Prof. Bury's general editorship), Prof. Parmentier of Liege and M. Bidez of Gaud, have recently called attention to a possible creation of a non-existing "Lake Boanensis" out of a false reading in Evagrius' 'Ecclesiastical History,' ii. 14. It is all but certain that transcriptional error gave birth to a heretic "Quintilla" in Portullian's 'De Baptismo,' 1, and it seems equally probable that "Lake Boanensis," which only exists in geographical indices in virtue of its supposed mention by Evagrius, must trace its genesis to the same source.

No one has ventured to mark its position on a map, though Kiepert in the last edition of his 'Formæ orbis antiqui' (ix. Asia Provincia) has printed the name as an alternative designation of *Lacus Sumonensis.* This, however, is a mere guess as old as Valesius (see his note on Ammian. Marc. xxvi. 8). The paper referred to appeared in tome xl. of the *Revue de l'instruction publique en Belgique*, and it may be of interest to give a brief *résumé* of it, prefaced by the words of Evagrius on which it is founded.

Καὶ ὄμβρους δὲ ἐξαισίους ὁ Πρίσκος ἱστορεῖ γενέσθαι ἀνὰ τὴν Κωνσταντινούπολιν καὶ τὴν Βιθυνῶν χώραν, ἐπὶ τρεῖς καὶ τέσσαρας ἡμέρας ποταμηδὸν τῶν ὑδάτων ἐξ οὐρανοῦ φερομένων. Καὶ ὄρη μὲν ἐς πεδία κατενεχθῆναι· κατακλυσθείσας δὲ κώμας παραπολέσθαι· γενέσθαι δὲ καὶ νήσους ἐν τῇ Βοάνῃ λίμνῃ, οὐ μακρὰν τῆς Νικομηδείας ἀφεστώσης, ἐκ τῆς συνενεχθέντων ἐς αὐτὴν παμπόλλων φορυτῶν.

So Evagrius ii. 14. But this Βοάνη λίμνη is mentioned nowhere else in the whole of Greek or Byzantine literature, while an examination of the manuscripts of Evagrius reveals the existence of another reading, not in itself acceptable, but which at least points to what was most probably the true original.

Βοάνη λίμνη has the support of four manuscripts, all of which represent only one type of text, which has been better preserved in codd. Laurentianus 695 and Patmiacus 688. Another type, wholly independent of these, exists in cod. Laurentianus 70, 23, and, so far as it has been examined, it appears to present a truer and correcter text than any other. For instance, in Evagrius iii. 8, where the other manuscripts place the death of the usurper Basiliscus ἐν Ἀκουσῷ, this manuscript gives the correct reading ἐν Κουκουσῷ, which is confirmed by Theophanes.

Now, in the passage under discussion, it reads ἐν τῇ καικιανῇ λίμνῃ instead of ἐν τῇ Βοάνῃ λίμνῃ. What can be made of καικιανῇ? There are in the neighbourhood of Nicomedia only two lakes, between which we must choose for the scene of the phenomena related by Priscus—Sumonensis (Sophon) and Ascania. Sumonensis is nearer to Nicomedia, but the name does not lend itself to the elucidation of the manuscripts. If, however, Ἀσκανίᾳ were the original reading, it is just possible that careless writing of the word led to a supposed correction, Βοάνῃ—Κ and Β being often confused in the manuscripts. But it is much more likely that our manuscript has preserved the true reading Κιανῇ, and that an *iotacism* (Κοιανῇ, Βοάνῃ) has to account for the error in the common texts.

Now, the channel which connects Lake Ascania with the gulf of Cius (Κιανὸς κόλπος) is termed by Strabo and Pliny the *River Ascanius*, but it appears to be also called *Cius amnis* (Plin. 'H.N.,' v. 32. § 144). It is argued, therefore, that the lake, like the river, could be termed indifferently Ἀσκανία λίμνη, or Κιάνη λίμνη, and that Evagrius wrote the latter. Thus, with regard to the *Boanensis lacus*, the writers of the paper here summarized conclude, "que ce lac livresque de la Bithynie est définitivement desséché."

The only criticism which one is inclined to make on this ingenious piece is that Pliny's words do not clearly identify the *flumen Ascanium*, which flows into the *Cianus sinus*, with the *amnis Cius*. His geographical notes are often extremely perplexing; but he is here describing the coast northwards from the Hellespont; and his words are, "Postea sinus in quo flumen Ascanium, oppidum Bryalion, amnes Hylas et Cius cum oppido ejusdem nominis." Here we have the gulf, the river, the town, and the two streams with a second town. The streams may indeed be the outlets of the Ascanius, for Ptolemæus ('Geogr.,' v. 1) speaks of the ἐμβολαί of the Ascanius; and Smith and Grove's Atlas boldly names the connecting channel *Cius F.*, ignoring the *flumen Ascanium* entirely. But these streams may equally well be different ones near to the town Cius.

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GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria-Hungary. **Schoeller.**
Trade of Austria-Hungary for the year 1897. Foreign Office, Annual No. 2160, 1898. Size 10 × 6½, pp. 32. *Price 2d.*

Belgium—Dochamps. *B.S.R. Belge G.* 22 (1898): 113–136, 201–221. **Delacollette.**
La commune de Dochamps. Par Louis Delacollette. *With Map.*

A piece of local descriptive geography.

Bulgaria. ———
Trade of Bulgaria for the year 1897. Foreign Office, Annual No. 2159, 1898. Size 10 × 6½, pp. 52. *Price 3d.*

France—Cherbourg. **Gurney.**
Trade and Agriculture of Cherbourg and District for the year 1897. Foreign Office, Annual No. 2035, March, 1898. Size 10 × 6, pp. 50. *Price 3d.*

France—Paris. **Baedeker.**
Paris and Environs, with Routes from London to Paris. Handbook for Travellers by Karl Baedeker. With 12 Maps and 33 Plans. Thirteenth Revised Edition. Leipsic: Karl Baedeker; London: Dulau & Co., 1898. Size 6½ × 4½, pp. xlvi., 428, and 24. *Presented by Messrs. Dulau & Co.*

France—Rouen. **O'Neill.**
Report for the year 1897 on the Trade, etc., of Rouen. Foreign Office, Annual No. 2027, 1898. Size 9½ × 6, pp. 22. *Price 1½d.*

Germany. *Deutsche Rundschau G.* **20** (1898): 615-516. ———
Der Rhein-Weser-Elbe-Canal. *With Map.*

Germany. *Tijds. K. Ned. Aard. Genoots. Amsterdam*, 15 (1898): 477–487. **Beekman.**
Het Dortmund-Eemskanaal. Door A. A. Beekman. *With Map.*

A description, with map, of the new canal from Dortmund to the Ems.

Germany. **Frisch.**
Die Vegetations-Verhältnisse und die Flora des Pöhlberg-Gebietes. Inaugural-Dissertation der hohen Philosophischen Facultät der Universität Leipzig zur Erlangung der Doctorwürde vorgelegt von Alban Frisch aus Annaberg. Annaberg, 1897, Size 9 × 6, pp. 96. *Presented by Prof. Ratzel.*

Germany. **Koenig.**
Agriculture in Germany. Foreign Office, Miscellaneous, No. 452, 1898. Size 9½ × 6½, pp. 86. *Price 4½d.*

Germany. **Mulvany.**
Coal Industry of the Rhenish Westphalian Provinces. Foreign Office, Miscellaneous, No. 454, 1898. Size 10 × 6, pp. 60. *Price 6½d.*

Germany—Bavaria. **Harford.**
Report for the years 1896-97 on the Trade and Agriculture of Bavaria. Foreign Office, Annual No. 2024, 1898. Size 9½ × 6½, pp. 22. *Price 1½d.*

Germany—Hamburg. **Ward.**
Trade of Hamburg and District for the year 1897. Foreign Office, Annual No. 2104, 1898. Size 10 × 6½, pp. 82. *Price 5d.*

Germany—Spree Valley. **Schwager.**
Die geographische Mannigfaltigkeit des oberen Spreethales in ihren ursächlichen Beziehungen zur Natur und zur Thätigkeit des Menschen. Inaugural-Dissertation . . . von Hermann Schwager aus Ebersbach. Zittau, 1898. Size 8½ × 6, pp. 86. *Presented by Prof. Ratzel.*

An essay on the geography of the Upper Spree Valley, with reference both to physical conditions and human settlements.

Greece. **Woodhouse.**
The Greeks at Plataiai. By W. J. Woodhouse. Reprinted from the *Journal of Hellenic Studies*, vol. xviii., 1898. Size 11 × 7½, pp. 33-59. *Map. Presented by the Author.*

A criticism of Mr. Grundy's work on the Battlefield of Platæa, the geographical portion of which is accepted as correct, and attention called merely to some matters of military and historical interest.

Greece—The Cyclades. **Cottrell.**
Trade of the Cyclades for the year 1897. Foreign Office, Annual No. 2102, 1898. Size 10 × 6½, pp. 18. *Plan. Price 2½d.*

Hungary—Lake Balaton. ———
Resultate der wissenschaftlichen Erforschung des Balatonsees. Herausgegeben von der Balatonsee-Commission der Ung. Geographischen Gesselschaft. Erster Band. Physikalische Geographie des Balatonsees und seiner Umgebung. Sechster Theil. Die chemischen Verhältnisse des Balatonsee-Wassers. Von Dr. Ludwig Ilosvay von Nagy Ilosva (pp. 30). Ditto. Zweiter Band. Die Biologie des Balatonsees und seiner Umgebung. Zweiter Theil, Die Flora des Balatonsees. Erste Section. Die Kryptogamen Flora des Balatonsees und seiner Nebengewässer. Von Prof. Dr. Gy. von Istvánffi. Wien: E. Hölzel, 1898. Size 11½ × 8½, pp. 148.

Italy. *B.S.G. Italiana* 11 (1898): 466–470. **Agostini.**
Il lago di Canterno (Sub-Appennino Romano). Notizie del socio dott. G. De Agostini. *With Sketch-map.*

Italy—Teramo. **Magistris.**
Monografia della provincia di Teramo. [Review.] L. F. de Magistris. [Estratto dalla *Rivista Geografica Italiana*. Anno v., fascicolo ii.–iii., 1898.] Firenze. Size 9½ × 6½, pp. 8. *Presented by the Author.*

Italy—Venice. **Allen.**
Grant Allen's Historical Guides. Venice. London: Grant Richards, 1898. Size 7 × 4½, pp. 270. *Price 3s. 6d. Presented by the Publisher.*

The object of these guides is, not to cover the ground already amply occupied by the usual guide-books, which travellers have learned to trust in practical matters, but to encourage and assist the study of individual towns from the point of view of their historical evolution as recorded in buildings and works of art. Hence the description of Venice necessarily begins with and depends on the physical geography of the region which made it possible for a city of the early middle ages to be at once an emporium of commerce and a sanctuary of art.

Mediterranean. **Radde.**
Deutsche Rundschau G. **20** (1897–98): 1, 66, 103, 150, 211, 259, 299, 348, 398, 458.
Zwei Fahrten in das Mittelmeer in den Jahren 1895 und 1897 auf den kaiserl. russischen Yachten *Polarstern* und *Sarniza.* Von Dr. G. Radde. *With Illustrations.*

Mediterranean—Cyprus. ———
Cyprus. Annual Reports for the year 1896–7. 1898. Size 10 × 6, pp. 84. *Price 4½d.*

Norway—Climate. *Skrifter Vidensk. Christiania* (1897): 1–11. **Mohn.**
Klima-Tabeller for Norge. III. Luftens Fugtighed. Af H. Mohn.

These tables give monthly and yearly means of atmospheric humidity for a large number of stations in Norway.

Rockall. *Scottish G. Mag.* 14 (1898): 393–415. **Christy.**
Rockall. By Miller Christy. *With Charts and Illustrations.*

The most complete account of Rockall yet compiled.

Rumania. **Lahovari.**
Dicționar Geografic al Rominiei . . . de George Joan Lahovari, și General C. I. Bratianu, Grigore G. Tocilescu. Vol. i. Fasc. i.–iii. Aaron-Vodă.—Botoșanĭ. București: J. V. Socecŭ, 1898. Size 13 × 9½.

The first parts of a very detailed geographical dictionary of Rumania published by the Rumanian Geographical Society.

Rumania. **Liddell.**
Trade of Galatz and District for the Year 1897. Foreign Office, Annual No. 2100, 1898. Size 10 × 6½, pp. 22. *Price* 1½*d.*

Russia. *Tour du Monde* 4 (1898): 313, 325, 337, 349, 361. **Meunier.**
Voyage d'un Congrès en Russie. Par M^me^ Stanislas Meunier. *With Illustrations and Maps.*

A finely illustrated account of the excursion following the recent International Geological Congress.

Russia. **Michell.**
Trade and Agriculture of Northern Russia, including Finland, for the year 1897. Foreign Office, Annual No. 2169, 1898. Size 10 × 6½, pp. 96. *Price 5d.*

Russia. **Smith.**
Beetroot Sugar Industry in Russia since its First Introduction in 1800. Foreign Office, Miscellaneous, No. 471, 1898. Size 10 × 6½, pp. 22. *Price* 1½*d.*

Russia. *Z. Ges. Erdk.* 33 (1898): 77–110. **Philippson.**
Geographische Reiseskizzen aus Russland. Das Russische Flachland. Von Dr. Alfred Philippson.

Russia—Finland Peat-bogs. **Andersson.**
Om flott-tegar i Finland. Af Gunnar Andersson. (Aftryck ur Geol. Fören. i Stockholm Förhandl. Bd. 20, Häft. 2, 1898.) Size 8½ × 5½, pp. 8. *Plans. Presented by the Author.*

Russia—Odessa. **Stewart.**
Report for the Year 1897 on the Agriculture of the Consular District of Odessa. Foreign Office, Annual No. 2023, 1898. Size 10 × 6½, pp. 20. *Price* 1½*d.*

Russia—Taganrog. **Hunt.**
Trade of Taganrog and District for the year 1897. Foreign Office, Annual No. 2076, 1898. Size 10 × 6½, pp. 32. *Price 2d.*

Russia—Ural. **Philippson.**
Geographische Reiseskizzen aus dem Ural. Von Dr. Alfred Philippson. [Aus den "Sitzungsberichten der Niederrhein. Ges. für Natur- und Heilkunde." Bonn, 1898.] Size 9 × 6, pp. 54. *Map and Profiles.*

A detailed account of the excursion through the Ural region during the meeting of the International Geological Congress in Russia in 1897.

Spain. *B.S.G. Madrid* 40 (1898): 54–78. **Blázquez.**
Vias romanas españolas. Por Antonio Blázquez y Delgado Aguilera.

On the Roman roads in Spain.

Spain. **Harrison.**
Trade of Spain for the year 1897. Foreign Office, Annual No. 2065, 1898. Size 10 × 6, pp. 38. *Price* 2½*d.*

Spain. *B.S.G. Madrid.* 40 (1898): 7–41. **Quirós.**
Hallazgos de Villaricos y luz que arrojan sobre nuestra geografia historica al sudeste del litoral Mediterráneo, por el Rvdo. P. Fr. Paulino Quirós.

On the discovery of the site of Villaricos, which is identified with Barea at the mouth of the Almanzora, in the south-east of Spain.

ASIA.

Asia. **Hedin.**

Through Asia. By Sven Hedin. 2 vols. London: Methuen & Co., 1898. Size 10 × 7, pp. 1278. *Maps and Illustrations. Price* 36*s. Presented by the Publishers.*

This great work represents the results of three and a half years' continuous travel and observation on the Pamirs, in the deserts of Taklamakan and the Lob-nor region, and in Tsaidam and Southern Tibet. The geographical results have been summarized by Dr. Hedin in the *Journal* from time to time. The book is illustrated by admirable maps, photographs, sketches, and coloured plates. It will be separately noticed.

Caspian Sea. *Iz. Imp. Russian G.S.* **34** (1898): 205–208. **Shpindler.**

Notes on the Temperature of the Caspian Sea. By I. B. Shpindler. [In Russian.]

Central Asia. *Globus* **74** (1898): 93–98. **Stieda.**

Jaworskis anthropologische Skizze der Turkmenen. Von L. Stieda. *With Illustrations.*

China. *J. China Br. R. Asiatic S.* **28**, 1893–94 (1898): 1–213. ——

Inland Communications in China. *With Maps.*

The Council of the China Branch of the Royal Asiatic Society sent out a circular to missionaries and others in 1890, asking for information as to the roads and other means of communication in the various provinces of China. The result is a valuable mass of data on the ancient and modern roads and tracks, with particulars as to rivers, ferries, inns, etc., illustrated by maps. The names are given in the Chinese ideographs, with a transliteration.

China. *Globus* **74** (1898): 69–71. ——

Das zukünftige Eisenbahnnetz Chinas. *With Map.*

China. ——

China. Imperial Maritime Customs. I.—Statistical Series: Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1897. Part II.—Reports and Statistics for each Port. With Report on Foreign Trade of China. Shanghai: Kelly and Walsh; London: P. T. King & Son, 1898. Size 11 × 9, pp. xiv. and 680. *Maps and Diagrams.*

China. **Jamieson.**

Journey from Hong-Kong to Ssŭmao. Foreign Office, Miscellaneous, No. 473, 1898. Size 10 × 6½, pp. 10. *Price* 1*d.*

Mr. Jamieson left Hongkong on December 18, 1898, landed at Haifong in Tongking, proceeded by river to Laokay, and thence by land to Ssumao, which he reached "on the 14th instant," but the report is not dated.

China. **Litton.**

Journey from Yachou to Tachienlu. Foreign Office, Miscellaneous, No. 475, 1898. Size 10 × 6½, pp. 16. *Map. Price* 2½*d.*

A journey from Yachou, on the Ya river, the key to the central plains of Ssuchuan, through the high mountain valleys to Ta-chien-lu, on the Tibetan border.

China. **Mansfield.**

Trade of Shanghai with Soochow and Hangchow for the year 1897. Foreign Office, Annual No. 2156, 1898. Size 10 × 6½, pp. 32. *Price* 2*d.*

China. *Nineteenth Century* **44** (1898): 386–399. **Moreing.**

A recent business tour in China. By C. A. Moreing.

This article deals rather with opinions formed than places visited; but some notice is taken of Shanghai and Peking.

China. *Deutsche Kolonialzeitung* **15** (1898): 268–272. **Tiessen.**

Die gegenwärtige Lage in China. Begleitworte zu einer Kartenskizze von Dr. E. Tiessen. *With Map.*

The map shows railways completed, in construction, and projected, and also the "spheres of interest" of the various European Powers.

China. *J.R. United Service I.* **42** (1898): 941–966. **Wagner.**

Two Memoranda regarding the Defences, Harbours, and Railways required by China. By Lieut.-Colonel Rheinhold Wagner. Translated by Captain P. Holland. *With Maps.*

China—Canton. **[illegible]**

Trade of Canton for the year 1897. Foreign Office, Annual No. 2175, 1898. Size 10 × 6, pp. 14. *Price* 1d.

China—Hainan. *B.S.G. Paris* **19** (1898): 187–228. **Madrolle.**

Étude sur l'île d'Hai-nan. Par Cl. Madrolle. *With Map.*

China—Manchuria. *Iz. Imp. Russian G.S.* **34** (1898): 117–184. **Komaroff.**

Manchurian Expedition, 1896, by V. L. Komaroff. [In Russian.]

China—Ningpo. **[illegible]**

Trade of Ningpo for the year 1897. Foreign Office, Annual No. [illegible], 1898. Size 9½ × 6½, pp. 8. *Price* ½d.

China—Wuhu. **[illegible]**

Trade of Wuhu for the year 1897. Foreign Office, Annual No. [illegible], 1898. Size 10 × 6½, pp. 12. *Price* 1d.

China—Yangtse Valley. *Contemporary Rev.* **74** (1898): 363–374. **Little.**

The Yangtse Valley and its Trade. By Archibald Little.

Chinese Empire—Tibet. **Landor.**

In the Forbidden Land. An Account of a journey in Tibet, capture by the Tibetan authorities, Imprisonment, Torture, and ultimate Release. By A. Henry Savage Landor. Also various Official Documents, including the enquiry and report by J. Larkin, Esq., appointed by the Government of India. 2 vols. London: W. Heinemann, 1898. Size 9 × 6½, pp. (vol. i.) xx. and 329; (vol. ii.) xvi. and [illegible]. *Map, Portraits, and Illustrations. Price* 32s. *Presented by the Publisher.*

Mr. Landor arrived in India on April [illegible], 1897, entered Tibet by the [illegible] pass, north of Askote, in long. 80° 30′ E., on July 13, passed westward along the south of the Mansarowar lake, and travelled eastward, descending the valley of the [illegible] until August [illegible], when he was captured by the Tibetans and brought back to [illegible], where on September [illegible], 1897, he was met by friends and left Tibet. The book is profusely illustrated by sketches, some coloured, and a few photographs. It will be specially noticed.

Chinese History. **Hirth.**

Zur Kulturgeschichte der Chinesen. Nach einem Vortrag von Prof. Dr. Friedrich Hirth. Sonderabdruck aus der Beilage zur "Allgemeinen Zeitung" Nr. [illegible] und [illegible] vom [illegible] und [illegible] Juli 1898. München, 1898. Size [illegible] × [illegible], pp. [illegible]. *Presented by the Author.*

A study of the history of Chinese civilization, with remarks on the possibility of Western influence.

French China—Saigon. **[illegible]**

Trade of Saigon and District for the year 1897. Foreign Office, Annual No. [illegible], 1898. Size [illegible], pp. [illegible]. *Price* [illegible].

India. [illegible] **[illegible]**

Report on the Expedition to Sahdol, Rewah State, Central India, to observe the Total Solar Eclipse of 1898, January 22. By W. H. M. Christie, M.A., etc., and Prof. H. H. Turner, M.A.

Total Solar Eclipse of January 22, 1898. Preliminary Report on Observations made at [illegible], Central Provinces. By [illegible].

Total Eclipse of the Sun, January 22, 1898. Preliminary Account of the Observations made by the Eclipse Expedition and the Officers and Men of H.M.S. [illegible] at [illegible]. By Sir Norman Lockyer, K.C.B., F.R.S.

Total Solar Eclipse of 1898, January 22. Preliminary Report on the Observations made at [illegible], India. By Captain E. H. Hills and H. F. Newall. With Plates.

India—Burma. [illegible] **[illegible]**

[illegible] and the [illegible]. By [illegible]. With Illustrations.

India—[illegible]. [illegible] **[illegible]**

The [illegible] of the [illegible]. By [illegible].

[illegible]

India—Survey Report. **[illegible]**

General Report on the Operations of the Survey of India Department administered under the Government of India during 1896–97. Prepared under the [illegible] direction of Major-General C. Strahan. Calcutta, 1898. Size 13 × 8½, pp. vi. 106, and lvi. *Maps and Plates. Presented by the Surveyor-General of India.*

The work of this Survey will be the subject of a special notice.

AFRICA.

Abyssinia. *Rev. Française* **23** (1898) : 480–484. ——

Abyssinie : La mission de Bonchamps.

African Islands. **Keller.**

Die Ostafrikanischen Inseln. Von Professor Dr. C. Keller. (Bibliothek der Länderkunde herausgegeben von Dr. Alfred Kirchhoff und Rudolf Fitzner. Zweiter Band.) Berlin: Schall & Grund, 1898. Size 10½ × 7, pp. viii. and 188. *Maps and Illustrations. Presented by the Publishers.*

This will be noticed elsewhere in the *Journal.*

Algeria. **Hay-Newton.**

Trade of Algeria for the years 1896–97. Foreign Office, Annual No. 2164, 1898. Size 10 × 6, pp. 40. *Price* 2½*d.*

Algeria—Sahara. *B.S.G. Paris* **19** (1898) : 229–260. **Foureau.**

Mon neuvième voyage au Sahara et au pays Touareg. Par F. Foureau. *With Map.*

This journey, occupying the early summer of 1897, led M. Foureau to Tasili, in the valley of the Ighargharen, in the Erg, about 600 miles south of Tugurt.

Algeria and Tunis. **Piesse.**

Collection des Guides-Joanne. Algérie et Tunisie. Par Louis Piesse. 8 Cartes et 22 Plans. Paris: Hachette et Cie., 1898. Size 6½ × 4½, pp. 54, lxvi., and 420.

Basutoland. ——

Basutoland. Annual Report for 1896–97. Colonial Reports, Annual No. 224, 1898. Size 10 × 6, pp. 56. *Price* 3*d.*

British Central Africa. *Nineteenth Century* **44** (1898): 448–454. **Koe.**

An African Adventure. By A. B. Koe.

The adventure occurred in 1893, and included some bush travelling while hostilities between the British authorities and some of the native tribes were in progress.

British East Africa Railway. ——

Africa. No. 8 (1898). Report on the Progress of the Mombasa-Victoria (Uganda) Railway, 1897–98. London: Eyre & Spottiswoode. Size 13 × 8½, pp. 6. *Map. Price* 6½*d.*

British East Africa—Uganda. ——

Africa. No. 7 (1898). Papers relating to Recent Events in the Uganda Protectorate. London: Eyre & Spottiswoode. Size 13 × 8½, pp. 58. *Maps. Price* 9*d.*

British East Africa—Zanzibar. ——

Africa. No. 6 (1898). Correspondence respecting the Abolition of the Legal Status of Slavery in Zanzibar and Pemba. London: Eyre & Spottiswoode. Size 13 × 8½, pp. iv. and 86. *Price* 9*d.*

British East Africa—Zanzibar. **Newman.**

Banani: the Transition from Slavery to Freedom in Zanzibar and Pemba. By Henry Stanley Newman. London: Headley Bros. [1898]. Size 9 × 6, pp. viii. and 216. *Maps and Illustrations. Presented by the Author.*

This book contains much information on the conditions of social life in Zanzibar and Pemba, and on the resources and economic position of the islands.

British West Africa. **Mockler-Ferryman.**

The Imperial Library. Imperial Africa, the Rise, Progress, and Future of the British Possessions in Africa. By Major A. F. Mockler-Ferryman. Vol. i. British West Africa. London: the Imperial Press, 1898. Size 9 × 6, pp. xvi. and 512. *Maps and Illustrations. Price* 12*s.* 6*d. Presented by the Publishers.*

This important work will be noticed elsewhere.

Canary Islands. **Ferguson.**

Report on Agriculture in Las Palmas. Foreign Office, Miscellaneous, No. 451, 1898. Size 10 × 6½, pp. 14. *Price* 1*d.*

Central Africa—Tanganyika. *Nature* 58 (1898): 404–408. **Moore.**
The Marine Fauna in Lake Tanganyika, and the advisability of further exploration in the Great African Lakes. By J. E. S. Moore. *With Map.*

Congo State. *Mouvement G.* 15 (1898): 204–205. ——
Exploration du Loange et de la Kantsha affluents du Kasaï. *With Map.*

Congo State. *Mouvement G.* 15 (1898): 375–376. **Wauters.**
Notre Carte, l'Urua, pays des Baluba. Par A. J. Wauters. *With Map.*

Egypt. *J.R. Victoria I. (London)* 30 (1898): 193–203. **Hull.**
The Proposed Scheme for Embanking the Waters of the Nile at Assouan, in Upper Egypt. By Professor Edward Hull, LL.D., F.R.S.

German East Africa. **Werther.**
Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika. Wissenschaftliche Ergebnisse der Irangi-Expedition 1896–1897 nebst kurzer Reisebeschreibung. Im Auftrage der Irangi-Gesellschaft herausgegeben von dem Führer der Expedition C. Waldemar Werther. Berlin: H. Paetel, 1898. Size 12 × 8, pp. 494. *Maps and Illustrations. Presented by the Publisher.*

This will be referred to with other recent books on Africa.

NORTH AMERICA.

Alaska—Maps. **Phillips.**
Alaska and the North-West part of North America, 1588–1898. Maps in the Library of Congress. By P. Lee Phillips. Washington, 1898. Size 9 × 6, pp. 120. *Presented by the U.S. Government.*

This is one of the useful bibliographies of special regions now being published by the Library of Congress.

America—Explorations. *Deutsche Rundschau G.* 20 (1898): 506–512. **Jüttner.**
Fortschritte der geographischen Forschungen und Reisen im Jahre 1897. 2. Amerika. Von Dr. J. M. Jüttner.

Canada. *Mission Field* 43 (1898): 321–331. ——
Klondyke and its Approaches. By the Bishop of Caledonia. *With Illustrations.*

Great Lakes. *B. American G.S.* 30 (1898): 226–254. **Russell.**
Geography of the Laurentian Basin. By Israel C. Russell. *With Maps.*

The region of the great lakes is described first with regard to its geological history, especially the position and extent of the ice-sheet, the temporary lakes of the withdrawal of the ice, and the origin of the present lakes. Then the influence of the geographical conditions thus inaugurated upon the historical and economic conditions of the country is fully treated.

Mexico. **Carden.**
Cotton Manufacturing Industry in Mexico. Foreign Office, Miscellaneous, No. 453. 1898. Size 10 × 6½, pp. 32. *Price 2d.*

Mexico. **Romero.**
Coffee and India-Rubber Culture in Mexico. Preceded by Geographical and Statistical Notes on Mexico. By Matias Romero. New York and London: G. P. Putnam's Sons, 1898. Size 10 × 7, pp. xxvi. and 418. *Map and Plates. Price 14s. Presented by the Publishers.*

This work will be specially noticed.

North America—Lakes. **Callahan.**
Johns Hopkins University Studies in Historical and Political Science. Series XVI., Nos. 1–4. The Neutrality of the American Lakes and Anglo-American Relations. By James Morton Callahan, PH.D. Baltimore, 1898. Size 9½ × 6½, pp. 200.

United States—Baltimore. **Rutter.**
Johns Hopkins University Studies in Historical and Political Science. Fifteenth Series. IX. South American Trade of Baltimore. By Frank R. Rutter, PH.D., Baltimore, 1897. Size 10 × 6, pp. 88. *Diagram.*

United States—Baltimore and Ohio Railroad. **Reizenstein.**
Johns Hopkins University Studies in Historical and Political Science. Fifteenth Series. VII.-VIII. The Economic History of the Baltimore and Ohio Railroad, 1827–1853. By Milton Reizenstein, PH.D. Baltimore, 1897. Size 10 × 6½, pp. 88.

United States—California. **Moore.**
Trade and Agriculture of California for the year 1897. Foreign Office, Annual No. 2152, 1898. Size 10 × 6½, pp. 56. *Price 3d.*

United States—Census. ———
[Eleventh Census of the United States, 1890.] Report on Vital and Social Statistics. Part i. Analysis and Rate Tables (1896, pp. xviii. and 1060, maps and diagrams, size 12 × 9½). Compendium of the Eleventh Census, 1890. Part iii. [Miscellaneous Statistics] (1897, pp. 1150, size 12 × 8). Report on Population. Part ii. Washington, 1897. Size 12 × 9½, pp. clxxvi., 824, and 142. *Presented by the Secretary of the Interior, Washington.*

United States—Florida. **Chambers.**
Johns Hopkins University Studies in Historical and Political Science. Series XVI., No. 5. West Florida and its Relation to the Historical Cartography of the United States. By Henry E. Chambers, Baltimore, 1898. Size 9½ × 6½, pp. 60.

United States—New York. *B. American G.S.* **30** (1898): 183–225. **Tarr.**
The Physical Geography of New York. By R. S. Tarr. Part iv. The Influence of the Glacial Period upon Topography. *With Maps and Illustrations.*

Like the preceding parts, this is a valuable discussion of the bearing on topography of physical conditions.

United States—North Carolina. *B.S.G. Genève* **37** (1898): 101–118. **Dufour.**
La nature et la vie dans les Montagnes-Bleues (Caroline du Nord). Par M. Alfred Dufour.

United States—Philadelphia. **Speirs.**
Johns Hopkins University Studies in Historical and Political Science. Fifteenth Series. III.–IV.–V. The Street Railway System of Philadelphia, its History and Present Condition. By Frederic W. Speirs, PH.D. Baltimore, 1897. Size 10 × 6, pp. 124.

United States—Rhode Island. *Ann. New York A. Sci.* **11** (1898): 55–72. **Hollick.**
Notes on Block Island. By Arthur Hollick. *With Map, Chart, and Plates.*

This is concerned mainly with the biological conditions of Block Island, giving a reference to an earlier paper on its geology. There is a map, but it is unprovided with a scale.

CENTRAL AND SOUTH AMERICA.

Paraguay. **Holmes.**
Trade of Paraguay for the year 1897. Foreign Office, Annual No. 2121, 1898. Size 10 × 6½, pp. 16. *Price 1d.*

Paraguay. *M.G. Ges. Hamburg.* 14 (1898): 1–28. **Jerrmann.**
Der Unterlauf des Igatimi und der Gran Salto Guayrá des Alto Paraná. Von Captain Ludwig Jerrmann. *With Map.*

A graphic description of a journey in the boundary district between Paraguay and Brazil, with a detailed map of the great falls of Guayra.

Peru—Anthropology. **Dorsey.**
Field Columbian Museum. Publication 23. Anthropological Series. Vol. ii. No. 2. A Bibliography of the Anthropology of Peru. By George A. Dorsey. Chicago, 1898. Size 10 × 6½, pp. 51–206.

This is a carefully compiled bibliography arranged alphabetically under the authors' names. An index is promised, which will add much to its value. As every available work is included which bears in any way on Peruvian anthropology, the value of the work to geographers is necessarily great.

Peru. ———
Relaciones geográficas de Indias. Publícalas el Ministerio de Fomento. Perú 4 vols. Madrid, 1881, 1885, 1897. Size 12 × 8½, pp. (vol. i.) cliv., 216, and clx.; (vol. ii.) l., 242, and clviii.; (vol. iii.) xl., 276, and clxxvi.; (vol. iv.) 46 and ccxliv. *Plate. Presented by Señor Marcos Jimeres de la Espada.*

Historical documents relating to the establishment of Spanish power in Peru and the exploration of that country.

Peru. **St. John.**
Trade and Finances of Peru for the year 1897. Foreign Office, Annual No. 2117, 1898. Size 10 × 6, pp. 22. *Price 1½d.*

Peru—Inambari. **Pando.**
Sociedad Geografica de La Paz (Bolivia). Expedicion del Coronel Don Jose Manuel Pando al Inambary. Circular e Informe de la Comision. La Paz, 1898. Size 9 × 6½, pp. 31. *Presented by M. V. Ballivián.*

Venezuela. *Deutsche Rundschau G.* **20** (1898): 394–398. **Sievers.**
Ein Schlammvulcan, Hervidero, in den Llanos von Maturin. Von Wilhelm Sievers. *With Illustrations.*

Virgin Islands. **Cookman.**
Virgin Islands. Report on the Condition of the Islands during 1897. Colonial Office, Miscellaneous, No. 10. London: Eyre & Spottiswoode, 1898. Size 10 × 6½, pp. 18. *Map. Price* 4½*d.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australian Tribes. *J. and P.R.S. New South Wales* **31** (1897): 154–176. **Mathews.**
The Totemic Divisions of Australian Tribes. By R. H. Mathews.

A careful study of the systems of tribal divisions amongst the aborigines of New South Wales.

British New Guinea. *B.S.G. Italiana* **11** (1898): 385–399. **Giulianetti.**
Nella Nuova Guinea Britannica. Lettera di Amedeo Giulianetti. *With Map and Illustrations.*

British New Guinea. **Macgregor.**
Despatch from his Excellency the Lieutenant-Governor of British New Guinea, reporting Visit of Inspection to district lying between Port Moresby and the head-waters of the Goldie and Brown Rivers. [No. 3.] Brisbane, January 3, 1898. Size 13½ × 9, pp. 12. *Sketch-Map. Presented by the Colonial Office.*

Fiji. *American J. Sci.* **6** (1898): 165–167. **Agassiz.**
The Tertiary elevated Limestone Reefs of Fiji. By Alexander Agassiz.

A note will be given on this paper.

Hawaii. **Griffin.**
Library of Congress. List of Books relating to Hawaii (including references to collected works and periodicals). By A. P. C. Griffin. Washington, 1898. Size 9½ × 6, pp. 26.

New Hebrides. *Deutsche G. Blätter* **21** (1898): 110–112. **Greffrath.**
Die Neu-Hebriden. Von H. Greffrath.

New South Wales. ———
New South Wales. Sixteenth Annual Report of the Department of Lands, being for the year 1895. Sydney, 1896. Size 13½ × 8½, pp. iv. and 98. *Maps and Plans. Presented by the Agent-General for New South Wales.*

New South Wales. **Coghlan.**
The Wealth and Progress of New South Wales, 1896–97. By T. A. Coghlan. Sydney, 1897. Size 9 × 6, pp. 1028. *Map. Presented by the Agent-General for New South Wales.*

New South Wales. *P.I. Civil Engineers* **132** (1898): 302–312. **Burge.**
Surveys and other Preliminaries to Railway Construction in New South Wales. By C. O. Burge.

New South Wales—Meteorology. **Russell.**
Department of Public Instruction. Meteorology of New South Wales. Results of Rain, River, and Evaporation Observations made in New South Wales during 1896, with Maps and Diagrams. By H. C. Russell, B.A., etc. Sydney, 1897. Size 10 × 6, pp. liv. and 210.

New Zealand. **Dadelszen.**
Report on the Results of a Census of the Colony of New Zealand, taken for the night of the 12th April, 1896. By E. J. von Dadelszen. Wellington, N.Z., 1897. Size 11 × 8½, pp. viii. and 164.

MATHEMATICAL GEOGRAPHY.

Geodesy. ———
Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Bestimmungen von Azimuten im Harzgebiete, ausgeführt in den Jahren 1887 bis 1891. Bestimmung der Längendifferenz Jerscheim—Kniel mittelst optischer Signale. Berlin: P. Stankiewicz, 1898. Size 11½ × 9, pp. 88. *Plate.*

Geodesy—Gravity Observations. **Helmert.**
Veröffentlichung des Königl. Preussischen Geodätischen Institutes und Centralbureaus der Internationalen Erdmessung. Beiträge zur Theorie des Reversionspendels. Von F. R. Helmert. Potsdam, 1898. Size 11½ × 9½, pp. 92. *Plate.*

Geodesy—Gravity Observations. **Krüger.**
Veröffentlichung des Königl. Preussischen Geodätischen Institutes und Centralbureaus der Internationalen Erdmessung. Beiträge zur Berechnung von Lotabweichungssystemen. Von Prof. Dr. L. Krüger. Potsdam, 1898. Size 11½ × 9½, pp. iv. and 106.

Geographical Instrument. **Jäderin.**
Ofversigt. K. Vet. A. Förhand. Stockholm **54**, 1897 (1898): 493–505.
Nivåsextant, konstruerad för Andrées polarballong. Af Edv. Jäderin.

Description of a sextant fitted with a spirit-level, and intended for use without an artificial horizon.

Latitude. ——
Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Die Polhöhe von Potsdam. 1 Heft. Berlin: P. Stankiewicz, 1898. Size 11½ × 9, pp. 140. *Diagram and Plans.*

A detailed account of the observations of the latitude of Potsdam Observatory, made with the highest precision in the investigation of the variation of latitude.

Longitude Determinations. *P.I. Civil Engineers* **133** (1898): 316-330. **Downes.**
The Determination of Longitude in Land Surveying. By R. H. B. Downes.

Specimens of the methods usually employed for determining longitude on land.

Nautical Astronomy. **Marcuse.**
Mittheilungen über neuer nautisch-astronomische Tafeln. Von Dr. Adolf Marcuse. (Sonder-Abdruck aus "Marine-Rundschau," 7 Heft, 1898.) Size 10 × 6½, pp. [8].

Time—Decimal Division. *Rev. Scientifique* **9** (1898): 804–808. **Sarrauton.**
Exposé du Systeme de l'Heure décimale. Par M. H. de Sarrauton.

Time Standards. *Rev. Scientifique* **9** (1898): 690–691. **Marcuse.**
L'heure nationale. Par M. E. Marcuse.

Time Standards. *Rev. G.* **43** (1898): 30–38. **Marsay.**
L'heure nationale. Par Vicomte R. de Marsay.

Arguments to show that it is undesirable to assimilate the legal time of France to that of the rest of Western Europe.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Coast-forms. *P.I. Civil Engineers* **133** (1898): 46–112. **Crosthwaite.**
The Stability of Channels through Sandy Estuaries. By Ponsonby Moore Crosthwaite. *With Illustrations.*

Geology. **Watts.**
Geology for Beginners. By W. W. Watts. London: Macmillan & Co., 1898. Size 7 × 5, pp. xviii. and 352. *Illustrations. Price 2s. 6d. Presented by the Publishers.*

This little book is particularly characterized by the admirable illustrations, many of them from geological photographs of great interest. It supplies what may be called the minimum of geology required by all geographers before the geographical features of any region can be understood.

Geomorphology. *Mém. S.G. Genève* **37** (1898): 45–86. **Girard.**
Études synthétiques sur la forme de la Terre. Par M. le Prof. Raymond de Girard.

A discussion of the knowledge of the ancients with regard to the form of the Earth, leading on to a summary of current theories as to the origin and precise form of the surface of the lithosphere.

Geomorphology. **Lapparent.**
Soulèvements et Affaissements. Par A. de Lapparent. Extrait de la *Revue des Questions Scientifiques*, juillet 1898. Louvain: Imp. Polleunis et Centerick, 1898. Size 10 × 6½, pp. 34. *Presented by the Author.*

A controversial paper dealing with the causes of differential crustal movement, and pointing out the evidence for the origin of rift valleys on the top of ridges raised by tangential thrust in opposition to the view that they arise from subsidence due to the withdrawal by volcanic outflow of subcrustal molten matter.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography. *Rendiconti R.A. Lincei* 7 (1898): 235–243. **Loria.**
Ricerche ulteriori sulla distribuzione topografica della industrie. Nota del Corrispondente Achille Loria.

A theoretical paper on the effect of distance between centres of production and of consumption of commodities.

Historical. ——
Beiträge zur Alten Geschichte und Geographie. Festschrift für Heinrich Kiepert. Berlin: Dietrich Reimer (Ernst Vohsen), 1898. Size 11 × 7½, pp. xiv. and 356. *Portraits, Maps, and Illustrations.*

A collection of twenty-seven memoirs on historical (mainly classical) geography, published in celebration of the eightieth birthday of Prof. Kiepert.

Historical—Map. **Magnaghi.**
La Carta Nautica costruita nel 1325 da Angelino Dalorto. Notizia di Alberto Magnaghi. Firenze: M. Ricci, 1898. Size 14 × 10, pp. 16. *Map. Presented by Principe Tommaso Corsini.*

A note on this paper will be given.

Historical—Toscanelli. *Mem. S.G. Italiana* 8 (1898): 138–154. **Uzielli.**
Colloquio avvenuto in Firenze nel Luglio 1459 fra gli ambasciatori del Portogallo e Paolo Dal Pozzo Toscanelli.

Historical—Vasco da Gama. ——
The Fourth Centenary of Vasco Da Gama's landing at Calicut. Celebrated on May 25, 1898, at Calicut. Calicut, 1898. Size 8½ × 5½, pp. 20.

Historical—Vasco da Gama. *B.S.G. Lille* 29 (1898): 401–425. **d'Avellar.**
Le Portugal et Vasco da Gama. Par M. le Dr. Éduardo d'Avellar. *With Map and Portrait.*

Notes on the historic growth of Portugal up to the era of discoveries, and a description of the chief Portuguese voyages.

BIOGRAPHY.

Banning. *Mouvement G.* 15 (1898): 355–358. **Wauters.**
Émile Banning. Par A. J. Wauters. *With Portrait.*

M. Banning took a prominent part in founding the International African Association, and in studying the history and political relations of West Africa.

Bouthillier de Beaumont. *Mém. S.G. Genève* 37 (1898): 1–14. **Claparède.**
Henry Bouthillier de Beaumont, Notice nécrologique. Par M. Arthur de Claparède. *With Portrait.*

M. Bouthillier de Beaumont was born in 1819, and died on February 4, 1898. He was an ardent student of geography, and the founder of the Geographical Society of Geneva.

Dronke. *Deutsche Rundschau G.* 20 (1898): 520–522. **Wolkenhauer.**
Dr. Adolf Dronke. Von W. Wolkenhauer. *With Portrait.*

Born 1837, died 1898; a teacher specially interested in methods of geographical instruction.

Garnier. *C. Rd. S.G. Paris* (1898): 285–292. ——
Inauguration du monument de Francis Garnier. *With Illustration.*

Johnson. **Bonwick.**
Australia's First Preacher; the Rev. Richard Johnson, First Chaplain of New South Wales. By James Bonwick. London: Low & Co. [1898.] Size 7½ × 5, pp. viii. and 264. *Presented by the Author.*

This biography is an interesting chapter in the first history of New South Wales.

Pöppig. *Deutsche Rundschau G.* 20 (1898): 518–519. **Wolkenhauer.**
Eduard Pöppig. Von W. Wolkenhauer. *With Portrait.*

Pöppig was born in 1798, and died in 1868. His work as a South American explorer is recalled in connection with the centenary of his birth.

GENERAL.

Ballooning. *Meteorolog. Z.* **15** (1898): 241–248. **Erk.**

Die erste Konferenz der internationalen aëronautischen Kommission. Von Fritz Erk.

Bibliography. **Wingate.**

Catalogue of Maps and Books in the Library of the Egyptian War Office. Accessions, 1894–1896. Prepared . . . by Lieut.-Colonel F. R. Wingate, C.B. London: Eyre & Spottiswoode, 1897. Size 10½ × 7½, pp. 12 and 38. *Presented by the Author.*

Educational—Methods. *G.Z.* **4** (1898): 431–454. **Müller.**

Die Bedeutung schematischer geologischer Profile für den Geographie-Unterricht an Mittelschulen. Von Prof. Johannes Müller. *With Profiles.*

A plea for the use of geological sections of a region in the teaching of geography, with examples illustrating the manner in which they may be employed. The proposal demands a knowledge of geology in excess of that usually found in school teachers.

Educational—Methods. *Naturw. Wochenschrift* **13** (1898): 373–381. **Schwalbe.**

Der achte naturwissenschaftliche Feriencursus für Lehrer an höheren Schulen, abgehalten in Berlin vom Mittwoch den 13 April bis Sonnabend den 23 April 1898. Bericht auf Grund eingegangener Beiträge durch Prof. Dr. B. Schwalbe.

Discusses, amongst other things, the geographical instruction in the vacation lectures to teachers.

Educational—Text-Book. **Bird.**

A School Geography. By Charles Bird. London: Whittaker & Co., 1898. Size 7½ × 5½, pp. x. and 294. *Sketch-maps. Price 2s. 6d. Presented by the Publishers.*

This little book is designed on a satisfactory plan, and does not fall into the error, now somewhat common, of subordinating important details to vague generalities. It bears signs of careful compilation; but a future edition will naturally smooth away such inaccuracies as the statement that some rivers of the English Lake District are tributary to the Yorkshire Ouse, that Inveraray is the chief town on the west of Scotland, and the like.

Educational—Text-Book. **Herbertson.**

An Illustrated School Geography. By Andrew J. Herbertson. Partly based on Frye's "Complete Geography," and including most of its Illustrations and Photo-Relief Maps, supplemented by others. With Sixteen Pages of Coloured Maps. London: Edward Arnold, 1898. Size 12½ × 10, pp. viii. and 264. *Price 5s. Presented by the Publisher.*

A note on this book will be given in the Monthly Record.

Geographical Congress. **Magistris.**

L. F. de Magistris. Il terzo Congresso Geografico Italiano (Firenze 12–17 Aprile 1898). [Estratto dal Bollettino della Società Geografica Italiana, Fasc. vi., 1898.] Roma, 1898. Size 9½ × 6, pp. 30. *Presented by the Author.*

Geographical Paradox. **Campion.**

The Secret of the Poles. By Henry Campion. Illustrated by an original Physical Map of the Earth in Space: showing approximately the thickness of its crust, its complete hollowness, both polar openings, the Antarctic and Arctic atmospheres, the entrance of the ethereal meteoric matter, and both Auroras. Birmingham: White & Pike, 1898. Size 7½ × 5½, pp. 48. *Presented by the Author.*

An example of the curious results of the combination of ignorance with a vivid imagination.

Geographical Work. *J. Manchester G.S.* **13**, 1897 (1898): 189–202. ———

Conference of Missionaries on Geography.

The Manchester Geographical Society called together a congress of missionaries of all denominations, with a view to obtain their views and enlist their sympathies with regard to the carrying out of geographical work in connection with Christian missions. The proceedings, here published, contain some interesting speeches.

Geography. **Corcelle.**

La Géographie et l'education nationale. Par J. Corcelle. (Extrait de la *Revue de Géographie.* Numero de Juillet 1898.) Size 10 × 6½, pp. 8. *Presented by the Author.*

M. Corcelle protests against the tendency, of which he believes he recognizes symptoms, to look on physical geography as the whole of geography. He deplores the reluctance of the French people to undertake distant travel.

German Colonies. **Whitehead and Rice.**

German Colonies, 1897. Foreign Office, Miscellaneous, No. 474, 1898. Size 10 × 6½, pp. 44. *Price* 2½*d.*

Health. **Romeril.**

[Course of Papers, No. 57.] Shipmasters' Society, London. Ninth Session. Quarantine: from a Shipmaster's point of view. By W. G. Romeril. London: Printed by Pewtress & Co., 1898. Size 8½ × 5½, pp. 56.

Health. **Sambon.**

Remarks on the Etiology of Sunstroke (Siriasis): not heat fever, but an infectious disease. By L. Westenra Sambon, M.D. (Reprinted . . . from the *British Medical Journal*, March 19, 1898.) Size 8½ × 5½, pp. 12. *Presented by the Author.*

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By J. COLES, *Map Curator*, R.G.S.

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Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme 1897. Scale 1 : 100,000 or 1·5 stat. miles to an inch. Sheets: 280, Getelomoor; 322, Züllichau; 328, Bocholt; 404, Solingen. *Price* 1.50 *marks each sheet.*

ASIA.

Central Asia. **Petermann's Geographische Mitteilungen.**

Profil durch das Flussbett des Amudarja bei Tschardschui. (Russiche Originalaufnahme.) Petermann's Geographische Mitteilungen, Jahrgang 1898, Tafel 15. Gotha: Justus Perthes. *Presented by the Publisher.*

Indian Government Surveys. **Surveyor-General's Office, Calcutta.**

Indian Atlas, 4 miles to an inch. Quarter-Sheets: 1 N.E., parts of districts Shikarpur, Kurrachee and Hyderabad, and Khairpur Native State (Sind, Bombay Presidency), additions to 1895; 11 N.E., part of district Thar and Párkar (Sind, Bombay Presidency); 11 N.W., parts of districts Hyderabad, Kurrachee and Thar, and Párkar (Sind, Bombay Presidency), additions to 1895; 24 N.E., parts of districts Surat, Thána, and Nasik, and of Dharampor, Bansdá, Jawhár and Surgána States (Bombay Presidency), and Daman (Portuguese Territory), 1898; 31 S.E. parts of districts Hissar and Ferozepore, and Native States of Patiala (Punjab), and Bickaneer (Rajputana Agency), additions to 1896; 35 N.E., parts of Native States Gwalior and Indore (Central India Agency), and of Oodeypore, Tonk, Boondee, and Jhallawar (Rajputana Agency), Additions to 1895; 36 N.E., parts of Banswara, Partabgarn (Rajputana Agency, Native States), Gwalior, Jaora, Rutlam, Sailand, Indore, Dewas, Jhabua, Bori and Dhar (Central India Agency, Native States), additions to 1895; 37 N.E., parts of districts Khandesh (Bombay Presidency), and Nimar (Central Provinces), and of Native States Indore, Gwalior, Dhar, and Barwani (Central India Agency), additions to 1892; 39 S.E., parts of districts, Sholapur, Admednagar, Poona, and Satara (Bombay Presidency); Naldurg and Bid (Nizam's dominions), additions to 1896; 49 N.E., parts of districts Moradabad, Meerut, Muzaffarnagar, and Bijnor (N.W. Provinces), Delhi, and Karnal (Punjab), additions to 1896; 61 S.E., parts of districts Coimbatore, Nilgiri, Salem, and Madura (Madras Presidency), 1898; 89 S.E., parts of district Mirzapur (N.W. Provinces), Native State of Rewah (Central India Agency), Cháng Bhakár, Koria, and Sargúja of Garhját States (Bengal); 127 S.E., parts of districts Chittagong (Bengal) and Akyab (Lower Burma), additions to 1887. Sheets: 88, districts Jaunpur and parts of districts Allahabad, Azamgarh, Benares, Fatehpur, Mirzapur, and Banda (N.W. Provinces), districts Rae Bareli, Partabgarh, and Sultanpur (Oudh); 94, parts of districts Khamamet (Nizam's dominions), of Kistna, Godavari, and Vizagapatam (Madras Presidency), and Bastar State (Central Presidency).—Bombay Survey, 1 inch to a mile. No. 192, district Nasik, Season 1871–1874. — Upper Burma Survey, 1 inch to a mile, Seasons 1891 to 1893. Sheets 89, 90, and 130. District Minbu. Sheet 314, Southern Shan States, Season 1894–95.—Lower Burma Survey, 1 inch to a mile. Sheets 371 (Preliminary Edition) and 476, District Thaton, Seasons 1894–96. — Central India and Rajputana Survey, 1 inch to a mile. Sheet 312, parts of district Gurgaon and Nabha Native State (Punjab) and of Ulwur and Jeypore Native States (Rajputana Agency). Seasons 1848–49–62.—Gujaret, 16 miles to an inch, 1898.—District Darjeeling, Lower Provinces, Bengal, 4 miles to an inch, Seasons 1861–67.—District Backergunge, Lower Provinces, Bengal, 4 miles to an inch, with additions to 1896.—District Bálaghát, Central Provinces, 12 miles to an inch, 1898.—District Dera Ismail Khan, Punjab, 16 miles to an inch, 1898.—District Ludhiána, Punjab, 16 miles to an inch, 1898.—District Wardha, Central Provinces, 8 miles to an inch, 1897.—District Delhi, Punjab, 8 miles to an inch, 1898.—District Bogra, Bengal, 8 miles to an inch, 1890.—District Cuttack, Bengal, 1890.—District Hazáribágh, 8 miles to an inch, 1894.—District Saugar, Bengal, Central Provinces, 8 miles to an inch, 1897.—District Bhandára, Central Provinces, 8 miles to an inch, 1898.—District Karnal, Punjab, 8 miles to an inch, 1898.—Chart of Triangulation, No. 12 Party (Sind), Sheet No. 17 (Sind), 2 miles to an inch, Season 1895–96. *Presented by H.M. Secretary of State for India, through the India Office.*

AFRICA.

West Africa. **Frobenius.**

Der westafrikanische Kulturkreis. Von L. Frobenius. *Petermann's Geographische Mitteilungen*, Jahrgang 1898, Tafel 14. Gotha: Justus Perthes. *Presented by the Publisher.*

AMERICA.

Canada. **Johnston.**

Map of the Dominion of Canada. Scale 1 : 5,070,000 or 80 stat. miles to an inch. W. & A. K. Johnston, Edinburgh and London, 1898. *Presented by the Publishers.*

This map has been produced in a bold style, suitable for schools.

United States. **Gannett.**

Statistical Atlas of the United States, based upon results of the Eleventh Census. By Henry Gannett. Published by the Department of the Interior, Washington, 1898. *Presented by the Secretary, U.S. Department of the Interior.*

This atlas, which has been compiled from the statistics of the United States eleventh census, under the supervision of Prof. Henry Gannett, is the joint product of many men and many minds. All matters relating to population, with the classification by race, nativity, sex, age, conjugal condition, occupation, illiteracy, education, and religion; dependent, defective, and delinquent classes; industries of agriculture, manufactures, and mining, have been prepared by Prof. H. Gannett. The numerous diagrams and maps relating to mortality have been prepared under the direction of Dr. J. S. Billings; those having reference to transportation by Prof. H. C. Adams; those dealing with wealth, debt, and taxation by Mr. J. K. Upton; and those relating to mortgage, indebtedness under the direction of Mr. G. K. Holmes.

This atlas contains maps and diagrams illustrating all the above subjects; these are so clearly drawn that they show at a glance their exact state in 1890, the date at which the last census was taken. Considering the vast amount of carefully compiled statistical information which this excellent atlas contains, and the evident care with which the maps and diagrams have been prepared, it is no matter for astonishment that so long a period should have elapsed before its appearance.

GENERAL.

Educational. **Pennesi.**

Atlante Scolastico per la Geografia Fisica e Politica di Giuseppe Pennesi. Istituto Cartografico Italiano, Roma, 1898. *Price li* 7.50.

This is a new edition of this atlas. Some alterations and additions have been made to bring it up to date, and the manner in which political and physical maps have been arranged is worthy of special commendation.

World. **Johnston.**

The Naval League Map, illustrating British Naval History. W. & A. K. Johnston, Edinburgh and London, 1898. *Price* £1 1*s.* *Presented by the Publishers.*

This map is drawn in a bold style, and is not overcrowded with names. The map is specially intended to illustrate British naval history. All the principal political boundaries are laid down, the positions of coaling-stations are indicated, and the limits of the British naval stations are shown. By referring to a table on the map, the positions of all the great British naval battles can be found, in addition to which a considerable amount of information in connection with British naval influence and power is given in tabulated form.

World. **Andree.**

Andrees allgemeiner Handatlas, 126 Haupt- und 130 Nebenkarten auf 186 Kartenseiten, nebst alphabetischem Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Bielefeld und Leipzig: Verlag von Velhagen and Klasing, 1898.

Lief 30, Frankreich, Südliche Hälfte; Ostchina und Korea; Japan.—Lief 31, Asiatische Türkei; Vereinigte Staaten von Nordamerika.—Lief 32, Europa, Politische Übersicht; Agypten und Nubien; Kapland, Natal, und Burenrepubliken Lüderitzland.—Lief 33, Europa, Niederschlagsmengen und Volksdichte; Deutschland, Physische Übersicht.

World. **Bartholomew.**

The Citizen's Atlas. One hundred maps and gazetteer. By J. G. Bartholomew, F.R.G.S. Published by George Newnes, Ltd., London. To be completed in 20 parts, issued fortnightly. Parts 15 and 16. *Price 6d. each.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during July and August, 1898. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
1828	m = 2·0	England, south-east coast:—The Downs. 2*s.* 6*d.*
1553	m = 6·8	Orkney islands, Kirkwall bay. 1*s.* 6*d.*
2966	m = 8·6	Lapland:—Port Ekaterininskoi and Pala bay. 2*s.*
2968	m = var.	Plans on the north coast of Russian Lapland:—Inner Teriberskoi bay, Podpakhta bay, Voroni and Gavrilova bays. 1*s.* 6*d.*
2969	m = 3·0	Plans in the White sea:—Kandalaksha approaches. 1*s.* 6*d.*
1515	m = 0·42	Portugal:—Burling island to Cape Espichel, including the approaches to the River Tagus. 2*s.* 6*d.*
2996	m = 0·5	Black sea:—Karkinitskago bay. 1*s.* 6*d.*
3006	m = var.	Anchorages and harbours on the north-west side of the Great Bahama bank:—Great Isaac anchorage, Dollar harbour, South Cat cay, Bemini islands, Barnett harbour, Gun cay anchorage, Riding rock anchorage. 1*s.* 6*d.*
522	m = 1·8	British Honduras:—Belize harbour. 2*s.* 6*d.*
3005	m = 1·8	Gulf of Mexico:—Tortugas harbour and approaches (plan, Tortugas harbour). 1*s.* 6*d.*
1673	m = 3·0	Plans on the coast of Brazil:—Jacuacanga bay. 1*s.* 6*d.*
837	m = 7·2	Anchorages in south-east Alaska:—Karta bay. 1*s.* 6*d.*
2288	m = 0·9	Alaska:—Lynn canal from point Sherman to head of inlet. 2*s.* 6*d.*
1668	m = 6·0	Anchorages on the Gold coast:—Accra, Appam. 1*s.* 6*d.*
123	m = 24·5	Africa, south coast:—Table bay breakwater and docks. 2*s.*
1641	m = 3·9	Harbours and anchorages on the coast of Formosa:—Toko Hakuchi. 1*s.* 6*d.*
1084	m = var.	Plans on the north-east coast of New Guinea:—Astrolabe bay, Port Constantine, Port Grand Duke Alexis, Finsch harbour, Friedrich Wilhelm and Prinz Heinrich harbours. 1*s.* 6*d.*
2238		Plan added:—Sungul bay.
581		Plan added:—Vere cove.
1449		Plan added:—Port Conclusion.
685		New Plan:—Limpopo river entrance.
1810		Plan added:—Angoche port and bar.
302		Plans added:—Entrance to the Koppi river, entrance to the Nelma river, entrance to the Luda river, entrance to the Ademi river, entrance to the Toropuichina river, Plitnyak bay, entrance to the Svyetloi river.
1730		Plans added:—Afono bay, Falealili harbour.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
1828	The Downs.	New chart. The Downs	1828
522	Belize harbour.	New Chart. Belize harbour	522
525	Plan of Tortugas harbour on this chart.	New Chart. Tortugas harbour and approaches	3005
123	Table bay breakwater and docks.	New Chart. Table bay breakwater and docks	123
1084	Plans on the north-east coast of New Guinea.	New Chart. Plans on north-east coast of New Guinea	1084

Charts that have received Important Corrections.

No. 2598:—The World, showing curves of equal variation. 1975, River Thames:—Kentish Knock to the West Swin. 1753, Ireland, east coast:—Belfast lough. 2327, Norway:—The Naze to Christiansand. 2260, Ports on the south coast of Norway. 2281, Norway:—The Naze to Karmö. 2317, Norway:—Tana fiord to Varanger fiord. 2272, White sea:—Kouzminskia hills and Cape Voronov to Nikodimskoi point and river Ruchi. 2275, White sea:—Gulf of Onega. 2256, Gulf of Riga:—River Dvina. 2613, France, north coast:—Cape Levi to Fécamp. 2835, Black sea:—Delta of the Danube. 565, Iceland, western portion. 566, Iceland, eastern portion. 2240, Iceland:—Approaches to Grundar and Kolgrafa fiords. 2976, Iceland:—Snefells Jökel to North Cape. 2733, Iceland:—Portland to Snefells Jökel. 2172, Bering strait. 285, Newfoundland:—Orange bay to Gander bay. 1452, Bahamas:—Nassau harbour. 525, Gulf of Mexico:—Boca Grande cay to Tortugas cays. 891, South America, east coast:—Pernambuco to Maceio. 530, South America, east coast:—Victoria to Santa Catharina. 85, Chile:—English narrows, etc. 660, Central America, west coast:—Corinto harbour. 579, British Columbia:—Strait of Georgia, Sheet I., Frazer to north-east point of Texada island, etc. 584, British Columbia:—Sydney inlet to Nitinat. 569, British Columbia:—Esperanza to Clayoquot. 1923A, British Columbia:—Cape Caution to Port Simpson, etc., northern portion. 2110, Anchorages in south-east Alaska. 2462, Alaska:—Windham bay to Icy cape. 608, Africa, west coast:—River Gambia entrance. 2812, Africa, west coast:—Lagos harbour. 1806, Africa, west coast:—Great Fish bay to Walfisch bay. 632, Africa, west coast:—Walfisch bay to Orange river. 1843, Africa south coast:—Buffalo river. 2908, Africa, south coast:—Port Natal entrance. 164, Red sea:—Massawa channel. 2760, Sumatra, west coast:—Acheh head to Tyingkok bay. 932, Harbours and anchorages on the coast of Java. 1965, Cochin China:—Kua Lacht to Kao Tao shan islands. 775, Cochin China:—Approaches to Haifong. 854, China, south coast:—Port Swatau. 1763, China, east coast:—Wen-chau port and approaches. 1601, China:—Wusung river or Hwang pu. 128, Japan:—Channels between Bingo Nada and Ozuchi sima. 2923, Australia, east coast:—Hope islands to Turtle group, etc. 2766, North-east coast of New Guinea, etc. 2460, North Pacific ocean:—Kamchatka to Kadiak island. 191, Solomon islands:—Mboli harbour. 2658, Solomon islands:—Gavutu and Tulage harbours.

(*J. D. Potter, Agent.*)

PHOTOGRAPHS.

New Guinea and Northern Queensland. **Guise.**

Fifty-nine Photographs of New Guinea and Northern Queensland, taken by R. E. Guise, Esq. *Presented by R. E. Guise, Esq.*

As will be seen by the titles below, the majority of these photographs are of anthropological interest. They form a useful series, and are a valuable addition to the Society's collection.

(1) Bulaa girl in ordinary dress; (2) Cape Grenville aboriginal (Australia); (3) Cape Grenville (Australia) native; (4) Saroa girl; (5) Saroa girl; (6) Bulaa warrior in fighting dress; (7) Bulaa girls in dancing dress; (8) Divorced women, Bulaa; (9) Kalo village; (10) Kalo girl in dancing dress; (11) Native Mission teacher with wife and child; (12) Bulaa warriors; (13) Dancing at Bataka; (14) Bataka village; (15) Bataka feast; (16) Bulaa girls with ornaments worn at dances; (17) Chief's daughter with attendant, Bulaa; (18) Chief's daughter, Bulaa; (19) House-canoe, Bulaa; (20) Bulaa; (21) House-boat, Bulaa; (22) Scene near Mount Elmore; (23) Scene near Mount Elmore; (24) Scene near Mount Elmore; (25) Kalo dancing-girl; (26) Scene at Kalo; (27) Koogi, or sacred house; (28) Male dancers, Hood point; (29) Leaders of the dance, Hood point; (30) Types of physique, Kamali, Hood point; (31) Part of Bulaa village, Hood point; (32) Babaka village, Hood point; (33) Babaka, Hood point; (34) Kamali girls; (35) Kamali girl; (36) Types of men, Kamali, Hood point; (37) Kamali, making roofing; (38) Bulaa, Hood point, girls in dancing-dress; (39) Irupara girl carrying water; (40) Scene at feast, Kamali; (41) Types of physique, Irupara; (42) Irupara girls; (43) Dancers, Koolupu; (44) Natives at Koolupu; (45) Koolupu, mountain village; (46) Return from market, Irupara; (47) Keakalo; (48) Keapara boy with pots; (49) Keakalo trading-canoe; (50) Part of feast, Kalo; (51) Exposition of sugar-cane at annual feast at Kalo, Hood point; (52) Part of feast at Kalo; (53) Trading Kebo, by canoe; (54) Cooking pork at feast, Kemali; (55) Native policeman and wife; (56) Scene at Waikunina, Kemp Welch river; (57) Scene at Waikunina, Kemp Welch river; (58) Scene at Waikunina, Kemp Welch river; (59) Tapu, staging for suspension of bananas, etc., in front of chief's house at annual feast (Kapa).

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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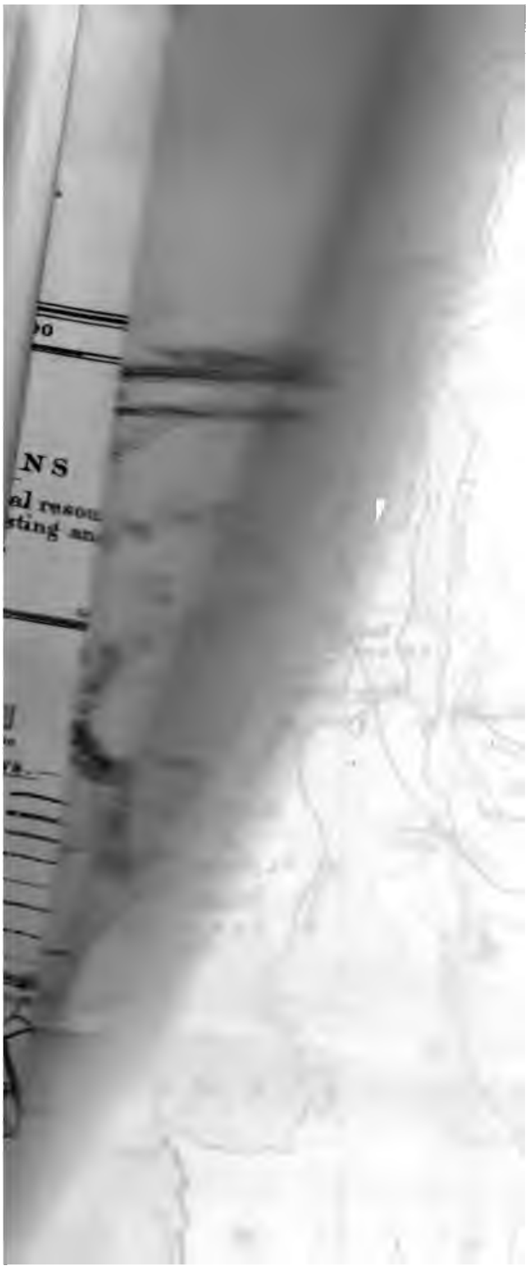
F. S. Weller, F.R.G.S.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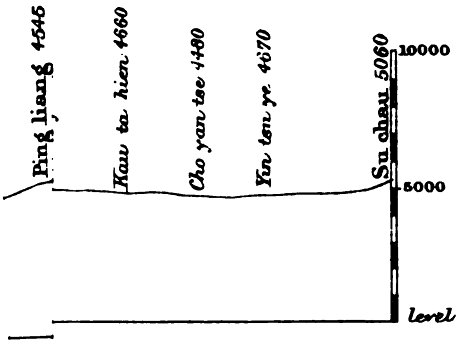

F.S.Weller, F.R.G.S.

The

Geographical Journal.

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THE GLACIERS OF NORTH AMERICA.

By Prof. ISRAEL C. RUSSELL, University of Michigan.

There is a popular impression that for the proper study of glaciers one must visit Switzerland. A tramp through that country is instructive and highly enjoyable, I freely admit, but in this paper I wish to show, among other things, that an American need not leave his own continent in order to gratify his taste for mountaineering and glacier study. We are greatly indebted to the many explorers who have climbed the Alps, for observations and theories concerning the nature and origin of glaciers, and are also under lasting obligations to European students for a vast amount of information concerning the time when much of the northern hemisphere was buried beneath vast ice-sheets, but for the study of both existing glaciers and the records of the Glacial epoch, North America furnishes an abundance of material. Before reviewing the present status of our knowledge concerning the glaciers of North America, let us endeavour to obtain a clear idea of what a glacier is, even at the expense of repeating what may be regarded as elementary information.

Suppose a climatic change should occur of such a nature that the snow falling over the surface of New England each winter should not be entirely melted during the succeeding summer. If the remnant left over from one year to the next were a foot thick, in a thousand years the land would be buried beneath a thousand feet of ice. The covering would be mainly ice, and not snow, except in its superficial portion, for the reason that the summer melting would lead to the saturation of the snow left unmelted, and when cold weather came it would freeze. Consolidation of the lower portion of the accumulation would also result from pressure. A cubic foot of ice weighs about 57 lbs. At the bottom of an ice-sheet 1000 feet thick the pressure would be 579 lbs. to the square foot. Now, since ice, in common with many other solids, behaves like a plastic body when subjected to sufficient pressure, a thick layer will tend to change its shape of flow under the influence of gravity. Without attempting to discuss the vexed question of the causes of glacial motion, I may say, as a result of accumulated observations, that an ice-sheet a thousand feet thick over New England would acquire motion and flow in all directions, the motion being greatest where it was favoured by the slope of the land. Such a bed of ice as we have built up in fancy is what is termed a glacier; that is, a glacier is a body of ice formed by the consolidation of snow, which flows by reason of its own weight.

The climatic change which would permit of the formation of a glacier over New England would be a lowering of the mean summer temperature to such a degree that the snow falling each winter would not be melted during the succeeding summer. In other words, a change in the mean summer temperature to about 32° would be required.

Such climatic conditions as we have assumed are not in violation of the laws of nature. There are numerous localities on the Earth's surface, ranging from the equator to the poles, where snow accumulates from year to year.

Mountains under the equator in Africa and South America, 18,000 feet or more in height, are snow-capped throughout the year. The lowest limit of snow at the season of greatest melting is known as the snow-line. That is, the snow-line is the lowest limit of perennial snow. As one travels either north or south from the equator, the snow-line descends lower and lower, and finally reaches the level of the sea in high latitudes. The conditions favouring the formations of glaciers are met with, then, in any region where the land rises above snow-line. We find, on examining such regions, not considering minor conditions, that glaciers originate above the snow-line, and, descending below it, melt away.

The places where perennial snow is possible outside the polar regions are on high mountains. The snow falling about lofty peaks accumulates most deeply at the heads of valleys and in great amphitheatres, and flows from these gathering grounds as streams or rivers of ice. These ice-rivers frequently descend, not only below the snow-line, but in numerous instances well below the highest limit of tree-growth or the timber-line. These long, narrow, river-like streams of ice were first studied in the Alps, and hence are known as "alpine glaciers."

Some alpine glaciers not only descend below the snow-line and traverse valleys bordered by luxuriant vegetation, but reach the plains adjacent to the mountains and spread out as nearly level ice-sheets. When several alpine glaciers expand in this manner and unite on a plain, a lake-like ice-body is formed. Such ice-bodies differ in many ways from their feeding ice-streams, and it is convenient to designate them by a separate name. Their occurrence about the bases of mountain ranges has led to the suggestion that they be termed "piedmont glaciers."

Glaciers also originate on plateaus and plains, where the winter's snow is not completely melted, as in the hypothetical case of the origin of a glacier in New England. The climatic conditions favouring the accumulation of perennial snow over broad plateau-like surfaces occur at the present time only in high latitudes. Under the conditions named, the ice flows in all directions from the central region of accumulation, unless local topographic influences prevail. These accumulations of ice are, in certain typical instances, of broad extent. The areas covered by them are, in fact, comparable with continents, and we term them "continental glaciers." At the present time a continental glacier covers nearly the whole of Greenland. In the southern hemisphere, the climatic conditions favouring ice-accumulation on low ground again occur, and we have the antarctic ice-cap, with an area approximately equal to that of North America, and an estimated thickness in the central part of many thousands of feet.

Glaciers of any of the three types I have mentioned, that is, the alpine, piedmont, and continental, may enter the sea. When this happens, the ice usually breaks off and floats away as bergs. On account of the well-marked characteristics of glaciers which terminate in this manner, it is convenient to have a general term by which to designate them, and we call them "tide-water glaciers."

Investigations carried on in North America by various explorers, have shown that we have many hundred, and possibly several thousand, glaciers of the alpine type. Two characteristic examples of piedmont glaciers are known in Alaska, and Greenland furnishes a typical example of continental glaciers. Several of the alpine glaciers of Alaska end in the sea; the great Malaspina glacier, the type of piedmont glaciers, also touches the sea for a few miles at Icy cape, near Mount St. Elias, and the Greenland ice-sheet sends thousands of bergs afloat. We have, in fact, many magnificent examples of tide-water glaciers.

America thus furnishes characteristic examples of all the types of glaciers now known, a statement that cannot be sustained in reference to any other continent.

All the glaciers of North America, not considering for the present those of Greenland or the arctic archipelago, are confined to the Cordilleran region, adjacent to the Pacific coast. We there find a belt of snow-capped mountains over 3000 miles long, and from 80 to 100 miles broad in its widest part, in which glaciers are of common occurrence. This great belt of shining mountains is curved so as to be rudely crescent-shaped. The extreme southern end of the crescent is in east-central California, and its north-west extremity on the larger of the Aleutian islands. At its ends this curved belt of snow and ice is broken into detached glaciers of small size, situated at high elevations among overshadowing peaks; but in its broadest portion, in the neighbourhood of Mount St. Elias and Mount Logan, the snow-line descends to within about 2000 feet of the sea, and hundreds of ice-streams come down to sea-level, and a score or more meet tide-water.

The most southern glacier in North America, so far as known, with a possible exception of perennial snow and ice about the summit of Popocatepetl in Mexico, occurs amid the most lofty peaks of the High Sierra, in Eastern California. In that region there are several peaks, such as Mount Lyell, Mount Ritter, Mount Dana, etc., which attain elevations of over 13,000 feet. These splendid summits are white throughout nearly the entire year, but in late summer, when seen from the southward, they seem to be completely bare of snow. On their northern sides, however, in the shelter of great cliffs, small snowfields may be seen from a distance at the season of greatest melting, but if one visits these snow-banks as they appear to be from a distance, he finds them to be actual glaciers. They are small, but present many of the characteristics of even the largest ice-streams of the alpine type. The larger, the one on the north side of the summit peak of Mount Lyell, is not over a mile long, but on traversing its surface one finds very many of the features common to true glaciers. There is an upper region of snow, or a *névé*, and a lower region of compact banded ice. Crevasses, glacier-tables, moraines, etc., as well as striated rock surfaces adjacent to the ice, are all present. Nothing is lacking, in fact, to make this and several other ice-bodies of the High Sierra, strictly counterparts of typical alpine glaciers, except the river-like form characteristic of the larger glaciers of Switzerland.

North of High Sierra, for several hundred miles, glaciers are absent. In fact, in the Sierra Nevada proper no glaciers occur except those mentioned above, in the highest and most rugged portion of the range.

Mount Shasta is a volcanic mountain with a double summit, standing west of the north extremity of the Sierra Nevada, and distinctly separate from that range. This splendid peak, rising in its solitary grandeur to a height of about 14,500 feet, is white with snow through the year, and from its summit gives origin to five glaciers. The largest of them, an ice-stream of the characteristic alpine character named Whitney glacier, in honour of Prof. J. D. Whitney, of Harvard, has a length of a little over two miles, and is from 1000 to 2000 feet wide.

The general line of elevation marked out by the rugged summits of the Sierra Nevada, is continued northward by the scarcely less imposing Cascade mountains. The Cascades also have a high central region in West Central Washington, where several peaks attain an elevation of 8000 feet or more. The snow-line is there lower than in California, and the climate far more favourable for the accumulation of perennial snow. In this, the High Cascades, as they may be termed, there are scores of glaciers, some of them of what may be termed respectable size, but as yet they are unexplored. From the summit of Glacier peak, in Northern Washington, the writer has counted fifty veritable glaçiers, and somewhat extended explorations in that region have shown that fully two hundred glaciers still exist there.

An outstanding watch-tower of the Cascades on the east, and separated from the crest of the main range by a belt of 20 to 30 miles of rugged country, is afforded by Mount Stuart, 9470 feet above the sea. This lone summit, rising spire-like from a group of encircling foothills, commands a most magnificent and far-reaching prospect of the Cascade region. Standing on the summit of Mount Stuart, or, better still, on the apex of some one of its score or more of supporting peaks, having elevations of about 7500 feet, the eye ranges over a region containing many objects of magnificence. To the south-west rise the snowy domes of Mount Hood and Mount Adams. Apparently near at hand, especially on the wonderfully clear days following storms, although some 70 miles distant, stands Mount Rainier, beloved of all the friends of nature who have ever seen its glorious summit. Below the gleaming snowfields, sheathing all the higher portions of this the finest single mountain in the United States, south of Alaska, there are several ice-streams which descend far into the encircling forests. More will be said in what follows of these fine glaciers.

What especially attracts the eye of the geographer who stands on the summit of one of the rugged foothills of Mount Stuart—particularly when the sun is rising above the distant cloud-like mountains of Idaho, or when only the summit of Rainier is aflame with the rosy light of the after-glow—is the generally even sky-line of the Cascades. On looking westward, one beholds what seems a vast plateau, rising gradually from far to the east of his station, like a great smooth surface swell of the sea, and attaining its maximum height along the sky-line to the west, about 7000 feet above tide. The plateau referred to, or, what is more nearly the case, the great elongated flat-topped dome, appears to have a smooth surface, because the valleys are in shadow, or filled with purple haze, and their presence lost to view. Mount Rainier stands on the Cascade plateau, and similar to it in position are Mount Hood in Oregon, Mount Adams, Mount Baker, and Glacier peak in Washington. Each of these commanding summits, once aglow with volcanic heat, is now glacier-crowned. From each peak long tongues of ice, forming typical alpine glaciers, descend in all directions, and in several instances invade the dark coniferous forests with which the lower slopes of the mountains are clothed.

The finest of these series of radiating glaciers clusters about the summit of Mount Rainier, 14,526 feet above the sea, and flows far down its rugged sides before melting away. In this cluster there are at least ten glaciers which descend below timber-line. These are bordered by pine and spruce trees, and flow between precipitous banks decked with gorgeous alpine flowers. The larger of these very characteristic glaciers, named in honour of S. F. Emmons of the U.S. Geological Survey, one of the first explorers to climb the great peak, is about 7 miles in length, and approximately a mile broad. Examples of all the typical features of the glaciers of Switzerland are here illustrated. Few glaciers in any country can show finer ice-cascades, crevasses, moulins, glacier-tables, moraines, etc., than are encountered by one who climbs Mount Rainier.

Alpine glaciers, in many ways typical of their class, occur in the elevated valleys of Montana. Still finer ones may be reckoned by the score in the central ranges of the justly famed Canadian Rockies. As the great Cordilleran belt is followed northward, the ice-streams descend to lower and lower levels, and finally in the southern extremity of Alaska, a few miles north of Fort Wrangell, they enter arms of the sea and become tide-water glaciers.

Travellers who have ascended Stikine river, which rises in British Columbia and flows west across South-Eastern Alaska, have described several fine examples of alpine glaciers, which descend from lateral canyons and encroach on the river itself, thus adding a unique attraction to its marvellous scenery. It was in the neighbourhood of the Stikine that Muir discovered a large lake, held in a lateral valley by a glacier which crossed its mouth. Glacial lakes of this type are common in the more extensively glacier-covered region to the north.

After sighting the floating ice discharged by Hotlum glacier, or the thunderer, just referred to, the tourists who visit Alaska by the usual route leading through the land-locked waters separating the many islands of British Columbia and South-Eastern Alaska from the mainland and from each other, see several glaciers above the dense forests fringing the coast, but none which reach tide-water are met with until Taku inlet is traversed, and the magnificent ice-cliffs of Taku glacier meet their astonished gaze. Taku glacier has its source far back in the mountains, in a region as yet entirely unexplored, and flows seaward through a deep rock-walled valley as a veritable river of ice nearly a mile broad. Where it enters the sea the ice stands in sheer cliffs of the most marvellous shades of blue and white, about 200 feet high. The ceaseless onward flow of the glacier is counterbalanced by the breaking away of great masses of ice from its terminus. These fall from the face of the ice-cliffs in avalanches, whose thunder is sent back in deep-toned reverberations from the surrounding mountains. The ice set free, after centuries of imprisonment, floats away as gleaming bergs.

The visitor to the wild Alaskan shores, who derives his first tangible ideas of a tide-water glacier from the one at the head of Taku inlet, will say, I think, that nothing could be at the same time more exquisitely beautiful and more awe-inspiring. If, however, his wanderings are to be continued westward, I would bid him wait.

The sail up Lynn canal, the route so many fortune-hunters are now following on their way to the Yukon goldfields, reveals scenes of wondrous beauty. Forest-covered shores, with many bays and inlets, overshadowed by rugged precipices, leading upward to snow-covered mountains, are the elements that in various combinations make up the ever-changing panorama bordering Lynn canal on either side. In the valleys between the ragged and serrated mountains there are scores of glaciers, some of which descend steep precipices and form beautiful ice-cascades. When the mists shroud the mountain-tops, these broken ice-falls seem cataracts of foam descending from the sky. The number of glaciers along Lynn canal can scarcely be realized by one who traverses that great inlet, once a river valley, but now flooded by the sea; but let the tourist climb some of the rugged peaks which command a far-reaching view over the deeply sculptured land, and every valley will be found to be partially ice-filled. On one occasion, from a peak about 3000 feet high near Dyea, I counted forty alpine glaciers, and a change in position of a few rods brought still others into view.

None of the glaciers on Lynn canal actually enter its waters, but a number come down to within a few hundred feet of sea-level. The most conspicuous of these is Davidson glacier, which expands on emerging from a deep high-grade valley, and forms a delta-like ice-mass fringed with a dense belt of spruce trees.

The reader who has patiently followed our lead thus far, perhaps needs to be encouraged by the statement that we are only on the border of the glacier wonderland. Scenes far more marvellous than any previously seen await the traveller who sails westward along the sublime Alaskan coast.

The next indentation of the land west of Lynn canal is Glacier bay. On entering Glacier bay from Icy straits, one sees before him a broad inlet, studded by fleets of gleaming bergs or packed with floating ice, so as to call to mind the accounts given by explorers of the borders of the arctic ocean. The head of the bay is beyond the reach of vision as one enters it, but far beyond rise white mountains of marvellous splendour. The highest of these is Mount Fairweather, which, although as yet not accurately measured, is over 15,000 feet high, and, with the exception of its steepest cliffs, is ice and snow covered from base to summit.

About the head of the inlet several large glaciers reach the sea, and break off in towering cliffs of ice. The largest and best known of these, named in honour of the discoverer of Glacier bay, John Muir, the well-known writer, drains an area of 800 square miles. A score or more glaciers of the alpine type there unite their floods of ice, which is forced out through an opening between rugged mountains about a mile broad, and breaks off in a manner characteristic of tide-water glaciers. The splendid palisade of ice in which the glacier terminates is from 250 to

300 feet high. The depth of water from which it rises is about 700 feet, making the thickness of the glacier at its terminus 1000 feet. From these shining cliffs, huge masses of ice, sometimes reaching from below the water's surface to the crest of the palisade, break away with a deafening roar, and topple over into the sea. During warm summer days these occurrences are repeated every few minutes, and in fact at such times the echoes from the neighbouring mountains are seldom silent. The scene beheld from the deck of a vessel anchored a mile from the terminus of Muir glacier is impressive, and will be long remembered by all who have feasted their eyes upon it; but still more wonderful scenes await one who climbs a neighbouring peak, and has in view the hundreds of square miles of rugged mountains from which the glacier derives its many tributary ice-streams.

Looking down on the glacier from a commanding station for the first time, one is filled with awe and wonder at the vastness of the panorama before him. The rough broken ice, with shining pinnacles separated by profound crevasses of the deepest blue in the central part of the stream just before it makes its final plunge into the sea, reveals the line of most rapid movement. The rate of ice-current is there about 7 feet a day during the summer, but is less in winter.

Turning from the ice-cliffs and rugged surfaces above them, and looking northward, one sees a broad valley, the bottom of which seems a nearly level pavement of ice. The way in which the mountains rise out of this ice-sheet shows it to be of great thickness. Not a tree is in sight, and not a trace of vegetation in all of the broad wintry landscape, except the exceedingly brilliant alpine flowers at one's feet. Far to the north rise white-robed peaks. Each valley between them is occupied by an ice-stream. One can count a score of separate glaciers, which unite to form the broad ice-field in the main valley.

Several other glaciers of the same general character as the Muir enter Glacier bay, and many more descend nearly to tide-water, but melt away before being able to add their contributions to the countless bergs that whiten its waters.

West from Glacier bay, the mountains which rise directly from the beating surf of the Pacific to great heights are bare and desolate, but in brilliant weather shimmer in the sunlight like burnished silver. Snow and ice fill every ravine and valley, and thousands of domes and precipices are sheathed in crystal. For 250 miles the coast-line is unbroken save by one small inlet, not easily accessible to ocean-going vessels. The next opening in the land is Yakutat bay, about 60 miles eastward of Mount St. Elias. The head of this inlet forms a long narrow waterway, which bends about the bases of the mountains like a broad river. Entering this land-locked estuary are four glaciers of the type of those discharging into Glacier bay. One of these, named in honour of Gardiner G. Hubbard, for many years president of the National Geographic

Society, is larger than Muir glacier, and ends in a mighty palisade of ice, which is even more magnificent than those we have just left in our fireside wanderings.

To the west of Yakutat bay there is a plateau of ice some 20 miles broad, which intervenes between the base of Mount St. Elias and neighbouring mountains and the Pacific. This ice-sheet at sea-level is fed by a number of large glaciers of the alpine type which flow down valleys in the mountains to the north, and has an area of about 1500 square miles, and its surface is, in general, about 1500 feet above the sea. This ice-sheet is strikingly different from any of the glaciers thus far considered. It has no gathering ground or *névé* fields of its own, but is supplied by ice-streams in much the same way that a lake at the base of a mountain range is fed by torrents. The ice-sheet in question has been named the Malaspina glacier, in honour of one of the earliest explorers of the Alaskan coast. As stated on a preceding page, it is the type of a class of ice-bodies termed piedmont glaciers. One of its most novel features is the presence of a forest growing on the dirt and stones which conceal the ice. Many square miles of dense vegetation have at least 1000 feet of ice beneath them.

At one place the Malaspina glacier enters the sea, and, breaking off, forms the finest tide-water glacier in the Alaskan region. This is the only locality on the west coast of North America where a glacier meets the surges of the open ocean.

From nearly everywhere on the ice-sheet at the base of Mount St. Elias the precipitous southern slope of that great peak is in sight. The mountain rises 16,000 feet above the broad glacier encircling its southern base, and has an altitude of 18,100 feet above the sea. The vast avalanches that rush down its southern slope illustrate on a grand scale the manner in which mountain peaks rising into regions where melting is unknown, are freed of their accumulations of snow. The avalanches feed the glaciers not only with snow and ice, but contribute to their freight of stones and dirt as well.

Mount St. Elias and its giant neighbour Mount Logan, 19,500 feet high, and, so far as now known, the loftiest summit in North America, rises from the most thoroughly glacier-covered region on the mainland of the continent. From the northern slope of Mount St. Elias, at an elevation of 14,500 feet, the highest point reached by the present writer in 1891,* the country to the northward, as far as the eye can reach, presents a vast succession of snowfields, with here and there a bare peak or crest too steep to allow snow to rest upon it. In this great gathering-ground hundreds of alpine glaciers have their birth. The largest yet discovered is the Seward glacier, the principal tributary of the Malaspina, which is about 50 miles in length, and about 3 miles broad in the narrowest part. The *névé* region just referred to has a general elevation of about 8000 feet, with hundreds of mountain peaks towering far above that horizon, and extends from the region about Lynn canal and glacier bay, westward past St. Elias and Logan to the vicinity of Copper river. This is the broadest portion of the crescent-like belt of glaciers and snowfields which follows the Cordilleran mountains from Central California to the Aleutian islands. To the west of Mount St. Elias the snow-line again rises, the snowfields become less and less extensive, and the glacier shrinks back farther and farther into the shelter of the peaks and mountain crests.

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* In 1897 the summit was reached by the Duke of the Abruzzi's party.

In Alaska and British Columbia, to the north of the mountains near the border of the Pacific, perennial snow is absent, and glaciers are unknown.

A journey from the High Sierra in Central California northward along the Cordilleran mountains would furnish hundreds, and probably thousands, of examples of alpine glaciers, and illustrate every phase that such glaciers present. In addition, the only known examples of piedmont glaciers would be found near the base of Mount St. Elias. To enlarge our studies of the glaciers of North America, and to add an example of a continental glacier to our list, a review is necessary of the work of explorers in Greenland and on the islands to the west of Baffin's bay and Smith sound. The greatness of this field, however, will preclude more than a brief outline of the facts known concerning it.

The area of Greenland, as stated by Peary, is about 700,000 square miles, and of this area about 600,000 square miles are buried beneath a glacier of the continental type. The central part of this covering is 8000 feet, and over, above the sea. As described by Nansen, Peary, and others, it is in reality a vast *névé* field, or gathering-ground, from which there is an outward flow in all directions. Throughout many hundred square miles in its central portion, the surface of the snow is unbroken by mountain peaks. The only feature that meets the eye of the hardy explorer is a seemingly boundless plain of snow. In travelling from the interior towards either the east or west coast, as has been shown, especially by Nansen's highly successful journey in 1888, one would at length see island-like summits of mountains, termed nunataks, projecting above the generally level snow surface. On a nearer advance to the coast, the nunataks would become larger and more numerous. Within sight of the Atlantic, or of Baffin's bay and the water connecting with it, strips of rugged land many miles in length form the actual coast. The central ice-sheet, many hundred and possibly seven or eight thousand feet thick, does not flow away from the central area of accumulation equally in all directions, but the outward drainage is influenced in a marked way by the topography of the land. The ice is drained off through the valleys, forming stream-like glaciers simulating alpine glaciers in some of their features. A continental glacier is thus a reservoir for the supply of lobes of ice and of well-defined ice-streams extending out from its border. Some of the streams draining the Greenland ice-sheet are from 10 to 30 miles broad. One of them, the Humboldt glacier, which flows west into waters leading to Baffin's bay, is reported to have a breadth of 45 miles where it enters the sea. This and other ice-streams on the Greenland coast are tide-water glaciers, and the largest of this class in the northern hemisphere. The bergs set adrift in Baffin's bay are reported to rise, in some instances, from 200 to 300 feet above the sea's surface; as they float with only about one-seventh of their mass above water, some idea of their immense size, and of the magnitude of the glaciers which gave them birth, can be realized. It is the bergs from this great factory, principally on the west coast of Greenland, that reach the Grand Banks and endanger trans-Atlantic commerce.

The tongues of ice extending out from the vast central gathering-ground in Southern Greenland, but melting away before reaching the sea, end in low frontal slopes in much the same manner as do alpine glaciers similarly situated in Alaska. In Northern Greenland, however, as has been carefully recorded by Chamberlin and others, the glaciers which end on land terminate in precipitous, and even in some instances in overhanging, escarpments 200 feet or more in height. These glaciers end on the land in cliffs of ice quite as steep as those found at the extremities of tide-water glaciers in more southern regions. The reason for this remarkable feature of the extremities, and also of the borders, of glaciers in the far north has not been clearly explained, although Chamberlin has made the suggestion that it is owing to the low angle of incidence of the sun's rays. The direct rays from the sun, as well as the reflections from the sea surface, reach the ice in nearly horizontal planes, and not at high angle as in more southern latitudes. Whether this is a sufficient reason for the peculiarities referred to, however, remains to be determined.

Remarkable glaciers discovered on Grinnell Land by the Greely expedition have been described by Lieut. Lockwood, as ending in great walls which could be traced across the land for many miles. One of these escarpments of ice is termed the "Chinese Wall," but it is a wall only when seen from the south, being the margin of a plateau of ice. The brief accounts brought by General Greely and others from the far north, although not as satisfactory as could be wished, are sufficient to show that many things of extreme interest to glacial students there await study.

We have now passed the existing glaciers of North America in rapid review, and can judge to some extent of the richness of this continent in objects of special interest to the student of glacial geology. It is safe to say that the mountains of the Cordilleran system hold thousands of glaciers of the alpine type, ranging in size from the great Seward glacier, probably the largest of its class known, to the small ice-bodies of the High Sierra. There are also two piedmont glaciers known, one the Malaspina glacier, briefly described in this paper, and a second on the coast to the west of the Mount St. Elias, and named Bering glacier. This second example, however, has only been seen from a distance, and no white man, so far as I am aware, has ever set foot upon it. Of continental glaciers, the one in Greenland is the only example in the northern hemisphere, unless the recently discovered ice-sheet of Franz Josef Land should prove to be of this type.

Space will not permit of a comparison of the glaciers of North America with those of other regions, but it is safe to say that no other continent affords such a variety of ice-bodies, or in such numbers.

It might be said that it is unfortunate America should have so much ice, but this is a matter which may be considered in two or more ways. The moderating influence of glaciers on climate, their conservative action on water-supply, etc., are frequently far-reaching and beneficent. To the geographer and geologist, glaciers are of more than passing interest, not only as illustrating the intricate working of the laws of nature at the present day, but for the reason that they furnish the key for unlocking a most interesting and instructive chapter in the Earth's history. But for the study of existing glaciers, the records of the Glacial epoch would still be a sealed book.

THE ENVIRONS AND NATIVE NAMES OF MOUNT EVEREST.

By Major L. A. WADDELL, LL.D., I.M.S.

As so little is yet known respecting Mount Everest, owing to its inaccessible position far within the jealously guarded territory of Nepal and Tibet, from which Europeans are rigidly excluded, I here record some notes on its nomenclature and topography which I have gathered during a visit to the Semorum pass, in the Yalung valley of Eastern Nepal, and from a Tibetan map and other sources.

Of the alleged native names for this mountain, which in this country is designated after Colonel Everest, the founder of the Indian Trigonometrical Survey, which revealed the surpassing height of this mountain, the one that is still current for it amongst continental cartographers, namely, Gaurisankar, has been conclusively proved by the late Colonel Tanner to be the name, not of Everest, but of a much smaller and totally different mountain altogether, about 40 miles to the west of that giant.* Moreover, Colonel Tanner and General Walker have shown that, owing to the curvature of the Earth, it is physically impossible to see Everest at all from the Kakani ridge and Kaulia peak above Khatmandu, in Nepal,* whence Hermann Schlagintweit believed he saw it and derived this name of Gaurisankar, which is an Indian title of the conjugal Hindu god Shiva. Nor is Everest visible from Tonglu (or even from Phalut), whence H. Schlagintweit made his sketch of the peak which he supposed to be the Everest of the Survey.† For this latter reason, also, I may add that Hooker's name of "Tsangau," which expressly referred to a mountain seen from Tonglu, could not designate Everest, even were it the specific name of a particular mountain or range, which, however, it is not. Because this word "Tsangau," notwithstanding the attempts to twist it into a support of the Gaurisankar theory, is a purely Tibetan word, and literally means "The Snows of Tsang"—Tsang, of course, being the adjoining province of Tibet, to the north of the Himalayas of Sikhim and Eastern Nepal. The word "Tsangau," therefore, has no specific significance whatever as a mountain name. And further, as to Gaurisankar, not one of the many natives of Eastern Napal whom I interrogated on this subject, and who lived within sight of the Everest range, had ever heard of the name Gaurisankar as the name of any of those or of any other mountains.

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* On this controversy upon the identity of Everest and Gaurisankar, see *Alpine Journal*, xii., 1886, pp. 483–460; *Proceedings R.G.S.*, New Series, 1886, vol. viii. pp. 88–94, 176–188, 257–263; vol. xiii., 1891, pp. 108–111; *Petermann's Mitteilungen*, xxxiv., 1888, and pp. 251–252, 1890.

So also with regard to the other Nepalese names, Bhairab Langur and Deodhunga—these do not denote either Everest itself or even, as Colonel Tanner seemed inclined to concede, the range of which Everest is the culminating point. For Bhairab Langur, or "The Terrible Pass," is the Indo-Nepalese name for that formidable Tibetan pass, the Gung Tang La, which lies about 50 miles north-west of Everest, on the track from Nepal to Lhasa *viâ* Nyalam, or "Nilam," as the Nepalese pronounce that Tibetan name. It was over this pass that the Jesuit fathers, in the sixteenth and seventeenth centuries, passed on their way between Nepal and Lhasa, and they have left a description of it on record.‡ And Deodhunga, or Deodhanga, the Indian vernacular for "God's seat or hill," is merely a general Hindu epithet for any sacred hill or hillock. There are hundreds of Deodhungas, but Everest is not one of them, as it is not sacred to the Hindus, nor even known to them as an exceptionally high mountain. For it lies so far behind the outer snows that its surpassing height is not apparent to the Nepalese, who seldom go near any of the snowy mountains, except the few which are sacred to the Brahmans, and Everest is not one of these. Hence has arisen the confusion in the names of peaks as obtained from Nepalese sources—owing partly to the extreme difficulty in identifying peaks from great distances, but mainly due to the remarkable looseness of the Nepalese in their nomenclature of the snowy mountains.

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* General Walker showed (in *Proceedings*, *loc. cit.*, vol. viii.) that Everest is 25′ (minutes) below the horizon, and has a very different azimuthal direction from Kaulia than that assigned to the peak referred to by H. Schlagintweit.

† Dr. Emil Schlagintweit, in his rejoinder to Colonel Tanner in *Petermann's Mitteil.*, above cited, writes, "The point of view on the Singalila range from which the Gaurisankar group was drawn, as it appears in the Atlas to vol. i. of the *Results*, was the Tonglo peak."

‡ Kircher's *China illustrata*, and Georgi's *Alphabetum Tibetanum*, article "Mons Langur."

The Tibetans, on the other hand, worship all the snowy mountains individually; and they especially worship Everest as the abode of "The five sister-nymphs of Long Life," and also as the hermitage of their great saint Milarapa.* And troops of pilgrims regularly ascend its flanks as far as the latter shrine, and still higher, for purposes of worship.

The Tibetan name of the Everest range, as pointed out to me from the Semorum pass by a Tibetan resident of Khumbu, at the southern foot of that range, was "Lapchi-Kang;" and the highest peak of that range was said to be Jomo Kang-kar, or "The White Glacier Lady." Another informant, however, maintained that Jomo Kang-kar was to the west of Lapchi Kang. But both agreed that our Everest was known to the Tibetans as Lapchi Kang. These two names, as noted by Mr. Freshfield, in the *Proceedings R.G.S.*,† have already been mentioned by Baboo Sarat Chandra Das as the Tibetan names of the Everest range and its highest peak. But my informants stated that this Everest range is properly "The *lower* Lapchi-Kang," in contradistinction to "The *upper* Lapchi-Kang," which lies considerably to the north of Everest, in Upper Tibet, and is not visible from Nepal.

In support of this nomenclature, I have seen in some Tibetan manuscripts the *upper* Lapchi-Kang noted as a high mountain as well as the Lapchi-Kang on the Nepalese frontier. And in the printed vernacular topography of Tibet, which has been partly translated by the above Babu,‡ the mountain "Chomo-kankar" comes second in the list of great snowy mountains, immediately after mount Kailas ("Tesi'" or "Ti-se"), the Hindu Olympus, at the source of the Indus and Tsangpo; and it is described as lying in this locality in these words: "To the east of the Kirong district lies Nalam or Nanam, in the vicinity of which are . . . Toipa cave, the hermitage of the sage Milarapa, and Ch'ubar, the place where Milarapa died. All these places are on the Tibet-Nepal boundary. Close to them are the recluses' monasteries of Phelgya-ling and Targya-ling, in the neighbourhood of that grand and very lofty snowy mountain called Jomo Kang-kar, and at the foot of Lab-chhyi Kang, on the top of which are the abodes of the Ts'ering-tshe-nga, the five fairies who were devoted to Milarapa. At the foot of Lab-chhyi Kang, on the Tibetan side, are five glacial lakes, each differing from the others in the colour of its water. . . . Travelling northward from Nanam, one arrives at the foot of a lofty mountain called Gung-thang La. . . . Crossing Gung-thang La, and going northwards, you arrive at the district of Tengri (Dingri)."

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* See my 'Buddhism of Tibet,' p. 67 note, 371, 430.

† Vol. xiii. p. 109.

‡ *Journal of Asiatic Society of Bengal*, vol. lvi. pt. i. p. 1.

Some further interesting details of this locality are given in a curious Tibetan picture-map obtained by Mr. A. W. Paul at Darjiling. This map bears no title, but it evidently represents the southern flanks of the Everest range,* for it has inscribed upon it certain place-names which definitely fix its position here, namely, Ch'ubar,† the site of St. Milarapa's death, the Kyung (eagle-) cave, his favourite hermitage, several shrines of the Ts'ering-ma, the special nymphs of Lapchi Kang (Everest),‡ and on the top left and right hand corners respectively, are inscribed the names of the adjoining Tibetan districts to the north of Everest, namely, Nalam ("Nilam") and Dingri. As it gives a rough bird's-eye projection of villages, bridges, and pilgrims' routes on one of the flanks of Everest, with many new names,§ I have made a tracing of it, on which I have printed the names in Roman characters; and, whilst reproducing an exact transcript of the Tibetan spelling, I have added in thicker letters the spoken form when this differs considerably from the written, so that the names may be generally recognizable. A few of the names were too illegible to be deciphered.

In this picture-map, the snowy range at the top is represented as ending in five peaks of conventional form, of which the middle three are capped by clouds, and the other two snowy peaks on the right border, above Ch'ubar, are also cloud-capped. The bold cliffy peak between the two passes has such an individuality of form that it may possibly prove to be something of a portrait of the sacred rocky peak on the shoulder of Everest. The shrines and villages are all marked by fluttering prayer-flags; and in the original are figured numerous pilgrims ascending and descending the mountain-paths.

The names of the two snow-passes are labelled Laskyi Kang and Chi-tsi respectively. Both of these are somewhat suggestive of Lap-chi Kang. For there are many ways of spelling native names in Tibet, owing to frequent differences between the written and spoken forms of the majority of native names, which are not fixed by printing; and this mountain is seldom named in printed books, as these latter consist almost entirely of translations of Indian Buddhist works and commentaries thereon. This name, as seen by me in a Tibetan manuscript,* was written *Lab-ch'i*, which would mean "The Pass of Death;" † but my illiterate guide at the Semorum pass interpreted the word as meaning "the glacier-ice of the Outer pass," which would give the written form of *Lab-p'yi sgangs*, which is pronounced "Lapchi Kang." In this regard it may be noted that in the name of the right-hand pass in the picture

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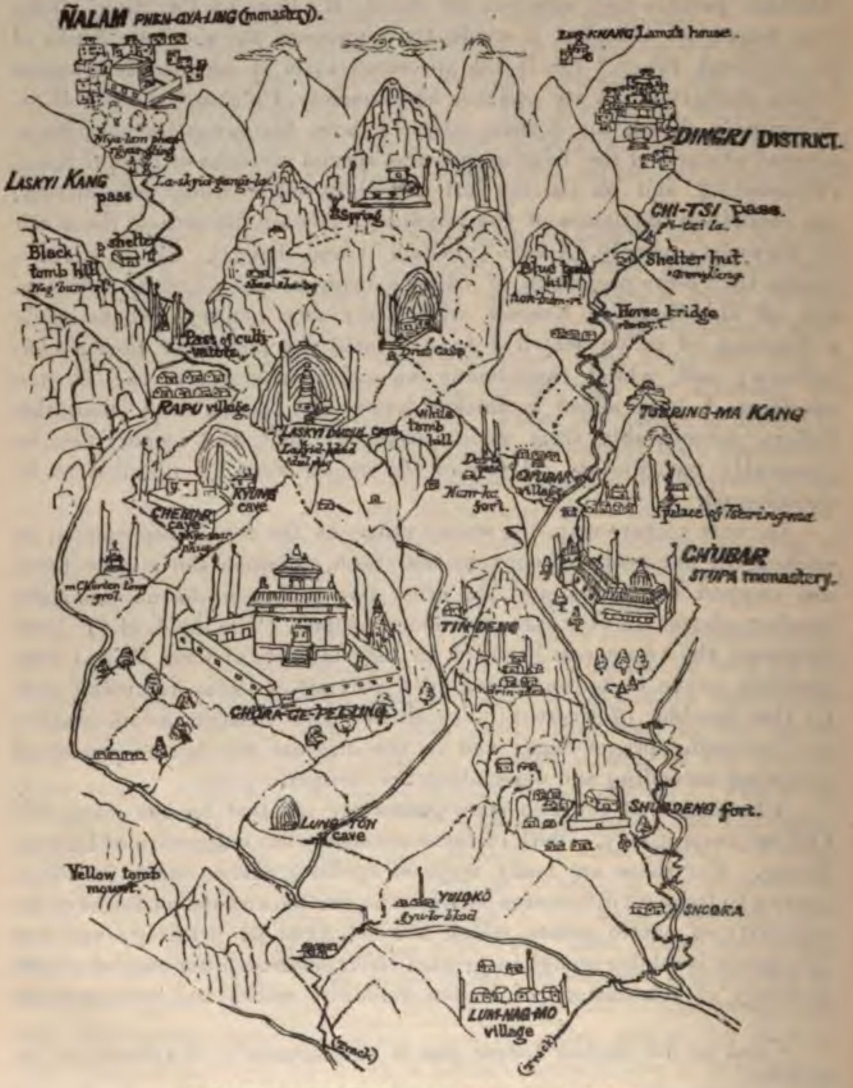
* And not the Bhairab Langur pass, as was suggested in this *Journal*, *loc. cit.*, p. 110.

† In addition to the reference in foregoing paragraph, see also my translation of Milarapa's biography in my 'Buddhism of Tibet,' p. 67, where the *b* is misprinted *g*.

‡ These, it is possible, give their name to Everest or Lapchi Kang, or have been suggested by a false etymology, thus—Lha-ch'e Kang means "The Icy Mount of the Divine Sisters."

§ As will be seen, the spelling differs materially from that given in the brief notice of the picture in the *Proceedings*, vol. xiii. p. 110.



TIBETAN PICTURE-MAP OF MOUNT EVEREST RANGE.

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* My 'Buddhism of Tibet,' p. 67 n. The *b* is misprinted *g*.

† The *b* is inserted for euphony, as in Lab-rtse, "the top of a pass."

there is a suspicion of a trace of a *y* under the *p*', which would also give this meaning of "Outer pass." Babu Sarat Chandra Das uses indiscriminately La*p*chhyikang and La*b*chhyikang, Chomokankar and Jomo Kangkar, and also varies the spelling of other words,* so that it is not evident what the written form of the word was in his manuscript. The name of the left-hand pass, as written in the picture, although suggestive in sound to Lap-chi Kang, has the euphemistic meaning of "The Pass to Happiness," referring doubtless to Milarapa's attainment of *nirvāna* on this mountain.

None of the villages named on this picture are to be found on any of the Himalayan Survey maps to which I have had access. They would appear to lie to the east of the Pangu or "Pang-ji" pass, and presumably on a route not yet traversed by the native explorers of the Indian Survey. It is to be hoped that some explorer soon may penetrate the Everest range, and wipe out the standing slur on our geographical knowledge, in that, although its highest peak is visible from Darjiling and other parts of British territory, we know as yet next to nothing about the king of mountains.

OCEANOGRAPHICAL EXPEDITIONS.

I. THE GERMAN DEEP-SEA EXPEDITION.

LETTERS have been received by Sir John Murray from Prof. Chun, the leader of the German Deep-Sea Expedition, giving particulars of the work on board the *Valdivia* down to September 14 last. After referring to the lively recollections cherished by all the members of the expedition of the hospitality extended to them during their visit to Edinburgh, Prof. Chun details one or two mishaps to the scientific apparatus and machinery; fortunately no one was hurt, and the damages were speedily repaired on board, so that the scientific observations suffered no interruption. The results so far obtained are of great interest to naturalists and oceanographers. Serial temperature observations were taken in the warm and cold areas of the Færoe channel, respectively south and north of the Wyville-Thomson ridge, which separates the ice-cold polar water flowing southwards from the warm Atlantic water flowing northwards, with the following results :—

	Cold area.		Warm area.	
Surface	9°·8 C. (49°·6 Fahr.)		10°·9 C. (51°·6 Fahr.)	
100 metres (55 fathoms) ...	7°·8 „ (46°·0 „)		9°·7 „ (49°·5 „)	
200 „ (109 „) ...	7°·6 „ (45°·7 „)		9°·7 „ (49°·5 „)	
300 „ (164 „) ...	6°·8 „ (44°·2 „)		9°·6 „ (49°·3 „	
400 „ (218 „) ...	3°·2 „ (37°·8 „)	Cold polar under-current	9°·6 „ (49°·3 „	Warm Atlantic under-current
500 „ (273 „) ...	0°·4 „ (32°·7 „)		9°·0 „ (48°·2 „)	
600 „ (328 „) ...	0°·1 „ (32°·2 „)		— —	

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* Thus Tshering-*tshe*-nga for Tshering-*mchhed*-nga. *Journal Bengal As. Soc., loc. cit.*, pp. 7 and 8; and *R.G.S. Proceedings*, xiii. p. 109.

Generally speaking, these observations corroborate those taken on board H.M.S.S. *Knight Errant* and *Triton* in 1880 and 1882.

Regular observations are made on the specific gravity of the surface waters, and, as opportunity offers, on that of the deeper waters; also on the density, colour, and transparency of the water, and on the direction of the surface currents. A meteorological register is kept, in which observations are entered every four hours, day and night, and self-registering instruments give continuous records of the barometric pressure, the temperature, and humidity of the atmosphere. In the chemical laboratory, the gases and chlorine contained in many deep-sea waters have already been determined, and this work will be carried on systematically in the future. The samples of deep-sea deposits are collected and preserved by the chemist under Prof. Chun's personal supervision. In some of the deposits the bacteriologist has observed many forms of bacteria, and in the samples of water from the greater depths various species of bacteria have also been found.

The dredgings and trawlings, and the observations with closing nets in intermediate waters, have yielded results of the greatest importance. Some of the trawlings were very successful, although, the region having been previously well explored by British Expeditions, the captures mostly belong to known types. For instance, on August 7, in the cold waters of the Færoe channel, from a depth of 588 metres (322 fathoms), the trawl produced an extraordinary rich harvest of deep-sea sponges (Hexactinellids and Tetractinellids), among which were many sea-lilies (*Antedon*), sea-stars (Ophiurids), sea-spiders (Pycnogonids), and deep-sea crustaceans. It was found impossible to preserve all the specimens procured, which can be readily understood when we are told that of a deep-sea Tetractinellid (*Thenea muricata*) over four thousand examples were brought up. The closing tow-nets and large vertical nets have been used with remarkable success. Many deep-sea Crustacea (*e.g.*, *Eryoneicus*, *Acanthephyra*, *Notostomus*, etc.), which were taken in the dredge and trawl by earlier expeditions, and were therefore supposed to live on the bottom, have been proved to live a pelagic life, floating or swimming in the intermediate waters. But especially interesting is the discovery that a number of deep-sea fishes, believed by Agassiz and Günther to live on the bottom, are pelagic. Thus, from at least 2000 metres (1094 fathoms) above the bottom were obtained a living *Melanocetus murrayi* (or *johnstoni*), a *Saccopharynx*, and two quite new types of black fishes, whose heads have a metallic lustre and are provided with gigantic eyes, which are of cylindrical form and like telescopes can be directed upwards or forwards. When the vertical nets were sent down to 3000 metres (1640 fathoms), there were obtained large numbers of most remarkable pelagic deep-sea forms, including, besides the crustaceans and fishes already mentioned, gorgeous Radiolaria (*Tuscarora*), violet-coloured jelly-fishes (Siphonophoræ), large Ostracoda the size of nuts, living gelatinous sea-slugs (Holothurians), strange cuttle-fishes (Cephalopods), and large new sea-butterflies (Pteropods), and it is possible to state with some exactitude the approximate depths in which all these organisms float, while the upper strata of water (down to 600 metres, or 328 fathoms) are apparently quite free from them. The interesting material procured by these closing nets is carefully examined immediately on being collected, so as to differentiate the organisms still living from those which are dead and have been captured in process of sinking towards the bottom. It may be recalled that Alexander Agassiz, as the result of his observations with closing tow-nets off the Pacific coast of Panama, declared his conviction that the intermediate waters of the ocean, from about 100 fathoms beneath the surface down to about 100 fathoms above the bottom, were uninhabited, but Prof. Chun's investigations evidently show that such is not the case. The botanist is paying special attention to the contents of these closing nets, with the view of determining to what depth below the surface living Diatoms, Peridiniæ, and Protococcaceæ descend.

On the way to the Canary islands, observations were made in the neighbourhood of the Josephine and Seine banks, which rise steeply from the ocean bed to within less than 100 fathoms beneath the surface of the North Atlantic. Around the Seine bank series of soundings and temperatures were taken, and the dredgings showed a great abundance of Crinoids (*Antedon phalangium*), Hydroids, and Antipathids.

Prof. Chun expresses himself pleased with the members of the scientific staff; each in his way takes his own share in the scientific work, superintending the manipulation of certain nets or special apparatus, so that the regular routine of the various deep-sea investigations now goes on smoothly. Captain Krech always maintains his good humour, and enters life and soul into the scientific work; he easily finds out the right methods of working the various appliances, and quickly detects any defaults in their mechanism; acting on his suggestions, changes have been made on board in the sounding-machines, which have turned out to be great improvements.

The expedition proceeds from the Canaries, by way of the Gulf of Guinea, to the Cape of Good Hope, Cape Town being reached early in November; and before sailing towards the antarctic ice, the Agulhas bank will be systematically explored.

II. THE AUSTRO-HUNGARIAN EXPEDITION TO THE RED SEA.

The work of the ss. *Pola* in the northern parts of the Red Sea has already been noticed in the *Journal* (1896, p. 180; 1898, p. 75). The investigations were continued between September 6, 1897, and May 24, 1898, in the southern Red Sea, from the latitude of Jedda to Perim, and thence to Aden, and a summary of the results has been prepared by Dr

J. Luksch. Besides numerous observations within the coral region, 54 deep soundings, 548 temperature observations, 305 determinations of salinity, 56 observations of transparency, and 102 of surface colour, were made at 123 separate stations. The shores of the southern Red Sea are little indented, the only inlets of importance are at Massowa, and at Kamaran, almost directly opposite. Animal and vegetable life are more abundant in the south than in the north, and there is a greater population. The land rises gradually on both sides from a low shore to a considerable height, limestone predominating in the northern region of the south basin, while the southern hills are volcanic in character. The relief of the sea-bottom from Jedda to the banks of Suakin and Farisan, in 20° N. lat., is of the same character as the northern part; the 100-fathom line keeps to the small coral-reefs, and pretty close inshore, and beyond it the bottom falls quickly to a great depth. The first expedition obtained a maximum depth of 1200 fathoms *north*-west of Jedda, and a similar depression of 1190 fathoms has been discovered about the same distance to the *south*-west; the two basins being separated by a ridge rising within 500 fathoms of the surface in the latitude of Jedda. Southward of this region the character of the bottom is essentially different, the shallow coral region, 300 miles long and 70 to 80 miles across, extending further and further seaward until in the latitude of Hodeida the deep channel (marked by the 100-fathom line) is only 20 miles broad, all the rest of the area being dangerous navigation to even small vessels. In the middle of the gradually narrowing channel three depressions were found; soundings were obtained in two of them—1110 fathoms in 20° N. lat., and 890 fathoms in 16° N. lat.—a little to the north of Massowa. To north-west of the volcanic island of Zebayír the depth is less than 500 fathoms; the bottom of the channel rises to the 100-fathom line at Hanish island (also volcanic), then shoals to 45 fathoms, and sinks again, about the latitude of Mocha, in a narrow channel which curves westward round the island of Perim (depth 170 fathoms), and loses itself in the Indian Ocean. This western channel is 16 miles wide in the straits of Bab-el-Mandeb; the eastern channel of the straits is 2 miles broad and 16 fathoms deep. The temperature of the water rises towards the southward, salinity at the same time decreasing. The type of distribution is similar to that in the northern part of the Red Sea; temperature is the same at all depths below 300 fathoms, and higher on the Arabian than the African side. The observations in the straits are of special interest: the distribution of salinity in Perim harbour, in the open sea to the south-east, and to the north within the Red Sea basin, as well as in the east and west channels, shows an inflowing current in the eastern channel of the straits, and an outflowing current of very salt Red Sea water in the western channel 50 to 100 fathoms below the surface. The "transverse currents" recognized by Luksch in the earlier work are also found in the south. In transparency and purity of blue colour, the water is again far behind that of the Mediterranean.

BALL'S 'ALPINE GUIDE.' NEW EDITION.*

MR. BALL's death, which occurred in 1889, naturally suggested the idea of re-publishing his Alpine Guide. It was felt that no more worthy memorial of the first President of the Alpine Club could be imagined, for the last edition—the third—which Mr. Ball himself had prepared, was published in 1870. Although in many parts the original text could hardly be bettered, minute knowledge of the Alps had in the interval become so elaborated that the excellence of the work as a whole was in danger of being overlooked in favour of publications giving the results of recent exploration. The Alpine Club laid a very heavy responsibility on any one who undertook the task of revising the volumes. Ball's Guides—though perhaps not so widely known as they deserve to be—were held in the very highest estimation by those who were best able to judge of the merits of a guide-book, which not only dealt with the whole of the Alps, but devoted special attention to the higher regions. It was necessary that the new edition, if it was to be worthy of its original author, should more than hold its own among the countless guide-books now extant. As yet only one volume of the three is published, but we may say at once, that if the standard of this volume can be maintained, the Alpine Club has reason to be proud of the success that has attended their endeavour to do honour to the memory of their first President. For this result they have to thank their editor. No one was better qualified by wide and intimate knowledge of the Alps than Mr. Ball to write the original guide, and certainly no one, for the same reason, was so capable of revising and reconstructing it as Mr. Coolidge. An additional difficulty in the task of editing lay in the fact that the work was a new edition, and not a new book. Mr. Ball was possessed of a charming literary style, which even the writing of a guide-book could not conceal, and Mr. Coolidge throughout has evidently endeavoured, and not without success, to give us the new edition, so far as possible, as Mr. Ball himself might have penned it. The present volume deals with the mountain groups of the Maritime, Dauphiné, and Pennine Alps, together with the Cottian and Graian districts. The extent of the mountain and glacier exploration achieved since 1870, may be gathered from the fact that the present volume is half as large again as the former one. The actual bulk of the book is not, however, increased, as the whole of the introduction has been cut out. We understand that it is contemplated to publish this also, revised by high authorities, in a separate volume. Mr. Coolidge, however, gives an extensive list of books relating to the

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* 'The Alpine Guide: The Western Alps.' By the late John Ball, F.R.S. A new edition, reconstructed and revised on behalf of the Alpine Club, by W. A. B. Coolidge. Longmans: London. 1898. With new and revised Maps.

Western Alps, of guide-books, Alpine periodicals (whose number is legion), and maps, together with a useful list of Club huts.

Without attempting any exhaustive notice of a book such as this—the full value of which can only be determined by actual use—we may note certain features in the new edition. As might be expected, information about the Dauphiné and Graian Alps has been largely extended, for of this district the editor undoubtedly possesses a greater knowledge than any one living. But other regions have by no means been neglected, and the editor has utilized the willing help of the most competent authorities, such as M. Louis Kurz, in the chain of Mont Blanc, and Mr. A. G. Topham, in the central and part of the eastern Pennines, to name only two out of many who have assisted. Those who, like the present writer, have used Ball's guide in the days when it was new, are disposed to be critical, and almost to resent any fresh touch or change in a volume they know so well, even when the alterations are unquestionable improvements. But a reviewer, even though actuated by this feeling, is silenced by the excellence of the work as a whole. To take one instance: we miss, if we can hardly regret, the omission of the well-known description of the ascent of the Dufourspitze of Monte Rosa, but we cannot but admit that it would be quite out of place in a guide-book for mountaineers of the present day. Scattered throughout the volume are numerous historical notes of much interest and value, and in many small points of detail the editor's accurate knowledge is evidenced and common errors are corrected. Thus Mr. Coolidge is careful to point out that the almost time-honoured idea that the Dom is the highest mountain wholly in Switzerland is incorrect, seeing that the frontier line between Switzerland and Italy runs south of the Dufourspitze. Again, as he points out, the summit of Mont Blanc lies wholly in French territory. It may be noted, in passing, that in neither case does the printing of the maps quite bear out these small geographical points. The arrangement of the index is an obvious improvement. In the original guide the entries were made under three different headings, one relating to the peaks or mountains, another to the passes, while the third formed a "general" index. Hotels are mentioned only in the index, and as this part can at any time be separately reprinted, the list can be kept up to date. It would be better also to place the list of Club huts at the end of the volume, for, as is pointed out in the preface, the building of a new mountain inn or Club hut, or the decay of an old one, entirely alters the mountain region from the point of view of the practical convenience of travellers. Included in the new volume are six district maps, one of the maritime, three of the Cottian, and two of the Graian Alps. In some respects these maps are hardly worthy of the work, but this is by no means the fault of the editor, whose work in connection with them seems very thorough. In addition there is a map of Mont Blanc and its neighbours, including the Sixt district; one of the central Pennines, taking in the Grand Combin and extending east up to the Dent d'Hérens, together with the Val d'Anniviers, the Val d'Hérens and the Val de Bagnes. Also one of the Eastern Pennines which takes in the Monte Rosa group and the Mischabelhörner, extending on the east as far as Domodossola. These three last, altered from the Alpine Club map on a scale of about 4 miles to the inch, are clear and well printed. No doubt it is convenient in a guide-book to have maps for general reference, but the editor points out justly in his preface that explorers of the higher regions of the Alps "*must* employ the more or less perfect maps issued by the various Government Surveys."

We look forward to the publication of the second volume, which will deal with the Central Alps. It is not probable that any further editions of the 'Ball's Alpine Guide' will ever be published, and it is all the more satisfactory to recognize that the present volume is likely to maintain, for a long time to come, its position of the best guide-book for those who are attracted to the sub-alpine or glacier regions.

The publication has been long delayed for reasons set forth in the preface. But the subscribers are not likely to complain in their satisfaction at finding the work so well done. Mr. Coolidge has never employed his encyclopædic knowledge of the Alps to better advantage than in rebuilding of this monument to the memory of one who was justly venerated by all mountaineers.

THE CRAWFORD MAPPEMONDE REPRODUCTIONS.*

By C. RAYMOND BEAZLEY, M.A.

THE three maps here reproduced are: A. The anonymous "Harleian" example, of about A.D. 1536, supposed by some to be the work of Pierre Desceliers of Dieppe, and undoubtedly belonging, like the two following, to the Dieppese school of cartography (British Museum, Addit. MSS. 5413); B. The Desceliers map of 1546, called by Jomard "The Map of King Henri II.," and now belonging to the Earl of Crawford (Bibl. Lind., French MSS. 15); C. The Desceliers of 1550 (B. Mus., Addit. MSS. 24,065).

(A.) is the oldest existing specimen of Dieppese cartography. It measures 8 feet 2 inches by 3 feet 11 inches; is graduated for latitude only, to 73° N. and 64° S.; and is executed on parchment with many ornaments, figures, etc. It bears the royal arms of Francis I. of France, and those of the Dauphin Francis, the latter with some unfinished detail which may hint at the sudden death of the Prince (August 10, 1536) just at the time of the completion of the map.

In this example some of the results of Cartier's first two voyages to Canada in 1534–36 are apparently embodied, and a close resemblance is to be seen with the North America of Hieronymo Verrazano (1529). Thus the isthmus of land above Florida, separating the North Atlantic from the "Western Sea" ("Sea of Verrazano," or supposed Pacific indent on the west coast of North America), appears in both, though in the Harleian map the isthmus is intersected by a river ("R. de St. Helene"). There is also some evidence of correspondence between this work and the Visconti de Maggiola Portolano of 1527; once more the Cattigara, or "Catagara," of Ptolemy's far East, turns up on the coast of Chili, and the "Camul" of Marco Polo's Central Asia is located on the west American coast, north-north-west of the Gulf of Mexico. But the draughtsman has evidently abandoned the notion of the American strand as a prolongation of Asia; an immense sea separates the two, in the middle of which is "Zipangri" (Japan), with a contour reminding one of an exaggerated Java turned on end (north to south).

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* 'Bibliotheca Lindesiana,' Collations and Notes, No. IV. Facsimiles of Three Mappemondes. 1898.

Alexander Dalrymple, in 1786, was one of the first to describe this (Harleian) map, which then belonged to Sir Joseph Banks; and he argued, from the similarity of some names here given on the east coast of "Java la Grande" with Captain Cook's nomenclature for the east coast of New Holland (Australia), that Cook was here only following in the track of an earlier explorer. For instance, *Botany Bay* is the *Coste des Herbages*, his *Bay of Inlets* the *B. Perdue*, his *Bay of Isles* the *R. de Beaucoup d'Isles*, and his "*shore where the Endeavour struck*" the *Coste dangereuse* of this map (*Périleuse* of B.). This charge may, however, be regarded as without foundation, or at least unproven.

The Harleian Design has sometimes been confounded with the Desceliers of 1546 ("Henri II."); has too often been ignored in cartographical controversy; and deserves a closer study and a clearer differentiation. Some, as Major, have thought its date might be even referred to about 1530; few would now contend for a later year than 1540; Harrisse ('Jean et Sébastian Cabot') fixes it to 1542 (1533, in his 'Discovery of North America'), but denies the suggested Desceliers authorship. All Desceliers' other maps are dated and signed; this is neither. On the other hand, it is of identical scale (*e.g.* with B.) and of almost identical configuration and nomenclature in its equatorial portions, "extending from the Orinoco eastward to Java la Grande" (Coote). It is unquestionably a French map, closely resembling the works of the Dieppe school, and in particular those of Pierre Desceliers.

As to special features, we may notice (besides the isthmus and "Sea of Verrazano," the prominence of Java la Grande in "Australian" form, and the character of Zipangri, already noticed), that the Caspian (of Ptolemaic character) is united, according to mediæval notions, with the Northern Ocean by a narrow channel; that the north of Asia, including all the continent above India and Indo-China, is, as might be expected, almost valueless and decidedly inferior, *e.g.*, to Herberstein's delineation of Western "Sibier," etc. (1517-1526); that the draughtsman knows next to nothing even of the east Asiatic coasts, now already coming within the ken of the Portuguese; that the Baltic regions have various curious features in this example, and may be both compared and contrasted with a map of 1492, among others (B. Mus., Addit. MSS. 15,760). The shape of North America, narrow and long-drawn-out from north to south, with an insignificant breadth, narrowing to an isthmus—itself divided by a "river"—somewhat north of Mexico, would be remarkable enough if it were in any way peculiar to this example, but this we know it is not. The delineation of Prester John and his work in Abyssinia is somewhat more elaborate than usual in maps even of this scale and elaboration. "Java la Grande," we may observe, is not explicitly joined on to the southern continent (which appears to the south of Magellan's Strait), but this is apparently due merely to the cutting short of the design at 64° S. lat.

On the coasts of Africa, South Asia, and South America, and among the East Indian islands, this map is a good chronicle of the progress of maritime discovery up to this date (*c.* 1536–1540). The draughtsmanship of the north-western shores of "Java la Grande" is clearly derived from Portuguese sources, and is plausibly supposed to indicate an early discovery of Australia by the Portuguese, as the alleged voyage of Binot Paulmier de Gonneville from Harfleur, in 1503, was probably limited to Madagascar (cf. the portolano of Francis Rodriguez, 1511–13? in Santarem's Atlas, 1849, fol. 84).

Whether the work of Pierre Desceliers or not, the Harleian map is the first and most important of the series, and we may fairly treat B. and C. as in the main derivatives of A.

(B.), the undoubted, signed, and dated work of Desceliers in 1546, measures 8 feet 2 inches by 4 feet $1\frac{1}{2}$ inch, and is graduated for latitude to 80° 40′ N. and 62° 50′ S.; for longitude from Ferro, except for a space in the Pacific between 211° and 272°. It was once the property of the great French geographer M. E. F. Jomard, and is now that of Lord Crawford; it is given in Jomard's Atlas, and described in his introduction as executed "by order of Henri II. of France," about 1550; its exact date and authorship were undiscovered by him, by Avezac (who supposed it to be of 1542, in the reign of Francis I.), by Kohl, by Major (in 1873), and even by Rainaud (in 1893). The inscription, "*Faictes à Arques par Pierre Desceliers, presb*^{re} 1546," was first noticed by Mr. Coote, of the British Museum, in August, 1879; communicated by Mr. R. H. Major to the Academy, May 18, 1878; and more widely published by M. Harrisse in his 'Jean et Sébastian Cabot,' 1882 (p. 216; cf. also p. 210).

In this it is noteworthy that the Great Southern Continent joining Tierra del Fuego with Java la Grande appears as "*La terre Australle : non du tout descouverte*"—although the southern prolongation of this example is not, by 1° 10′, so great as in A. The delineation of the river and gulf of St. Lawrence shows an advance upon the Harleian example; De Roberval, commander of the French Canadian expedition of 1542, is depicted at the head of his soldiers; the coast-line of Nova Scotia and the United States is very different from the same upon the "Harleian." Further, the indent of the Sea of Verrazano has disappeared; the isthmus north of Mexico exists no longer; the conquest of Peru by Francisco Pizzarro in 1531 is noted; and the delta of the Orinoco is remarkably well drawn. Some use seems to have been made of the descriptions of Vespucci as to Brazil (third voyage), and of Mandevillian and other fabrications as to the races in North-East Asia, with their heads between their shoulders.

Northern Asia is not quite so inadequately conceived as on A.; the Caspian is not made to connect by a strait of sea with the Arctic Ocean, and the north-east of the Old World has a somewhat greater extension. But the coasts and upland from Canton round to Norway are not much more accurate than in the Harleian map. Only the space allotted, as in the case of North America, comes rather nearer to actual fact.

(C.) The Desceliers of 1550 (B. Mus., Addit. MSS. 24,065) is somewhat smaller than A. and B., though even more ornate. It measures 7 feet 2 inches by 4 feet 5 inches, but is on the same projection and scale. It is graduated from the equator to 84° 30′ N. lat. and 62° 30′ S. lat., and its longitude is reckoned from Ferro, with a gap between 270° and 175° 30′ in the Pacific. This work was discovered at Padua in 1847 by M. C. A. de Challaye, who first described it in the *Bulletin de la Société des Antiquaires de l'Ouest*, Potiers, 1852 (pp. 343–350).

Here are specially to be noticed the treatment of "Laborador" and "Terre Neufe," of the Gulf of St. Lawrence, and of the river Amazon, which here first appears in the Desceliers series of maps. For the coasts of Newfoundland we may compare the Nicolas Vallard Portolan of 1547, for the Labrador "Sebastian Cabot's" Mappemonde of 1544. The example of 1550 is specially notable for its inscriptions, on little slabs or notice-boards of space, scattered all over the world, and descriptive of various countries, peoples, places, etc. Twenty-five of these are particularly important, viz. one in South America (the longest of all), two in North America (the far north), eight in the southern continent or Terre Australle, two in Africa, one in Arabia, three in Southern and Central Asia, two in the north of Asia, one between the Caspian and Black sea, one at the arctic shore north of the Caspian, one in the position of Lapland, one in the ocean north of Iceland, and two north and north-east of Zipangri. Neither on B. nor C. does the Caspian communicate as a sea with the Northern Ocean.

The "great land of Java" south of the East Indies on all these maps seems undoubtedly to mean Australia—though the knowledge then possessed of that country (as shown here) was so imperfect that some have disputed this, and contended that the Desceliers maps only give us a "longitudinally misplaced portion of the south coast of Java proper, plus a certain amount of purely theoretical cartography." The east coast-line of Java la Grande is not probably based on any real observations, though M. A. Rainaud has claimed at least the possibility of this, on the strength of the alleged discoveries of Guillaume le Testu. It does not seem to be derived from Spanish or Portuguese charts of this time, such as the Portolani of Diego Homem, 1558, and of F. Vaz Dourado, 1571, neither of which show any trace of an Australian or Antarctic continent, though some indication is given of New Guinea in Dourado's map. With this we may compare the *Las Papuas* of Desceliers. In the East Indies, to some extent, the Desceliers maps have been criticized as archaic and retrograde. The draughtsman has apparently misconceived the route taken by Magellan's expedition of 1519–22, of which, though he makes no express mention, he can hardly be supposed ignorant; thus in the design of 1550 the channel south of Timor is represented as if blocked, two men in a picture adjoining being engaged "with pick and shovel, as if in the act of cutting it open." Collingridge ('Discovery of Australia,' Sydney, 1895, p. 173; see also p. 116, on A.) considers, however, that this "channel between Java and Australia is evidently a concession due to the fact that a passage was known to exist," and he points out that this passage, though "painted over in the 1550 specimen," is "left white" in the Harleian map. On the other hand, Mr. C. H. Coote, our chief English authority on all questions connected with these maps, seems to deny that Desceliers had any knowledge of regions south of Java proper—a conclusion with which some will find it hard to agree. Also, beyond the name Las Papuas, no information is given us about New Guinea. In all this part of his work Desceliers probably owed something to Oronce Finè's *Nova et integra universi orbis descriptio*, whose *Bresille regio* is perhaps the origin of Desceliers' "Baye Brasille." Mr. Coote has furnished these reproductions with a masterly introduction (18 pp., privately printed, 1898) invaluable to every student. We may also, perhaps, draw attention to the new and improved method of reproducing these unwieldy documents, whereby the facsimiles can be consulted in detail, or as a whole, by the removal of the inner margins and the adjustment of the numbered sections edge to edge with the aid of the key-map. The Autotype Company deserves the cordial thanks of all students of historical geography for their success in this fresh line of reproduction, Mr. Coote for his supervision of the same, and above all, Lord Crawford for his munificent encouragement of cartographical research.*

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* Besides the references given above, the student might consult: 'Early Voyages to Terra Australis' (Major), p. xxvii. and the map illustrations facing pp. xxvii. and xxix.; Harrisse, 'Discovery of North America,' p. 647, where A. is placed among "doubtful maps" of 1533; Jomard's 'Atlas,' plate xix. 1–6; Rainaud's 'Continent Austral,' pp. 288–291; Major in *Archæologia*, xliv. p. 235; Avezac in *Bulletin de l'Académie des Inscr. et Belles-Lettres*, August 30, 1867, p. 7; Kohl, 'Discovery of Maine,' p. 351; Delmar Morgan, 'Remarks on Early Discovery of Australia,' pp. 6–12.

MAP OF LAKE NYASA AND THE UPPER SHIRE RIVER.[*]

By ALFRED SHARPE, C.B.

This map is compiled from the work of two of the naval officers of the British Central Africa Protectorate, Lieut. E. L. Rhoades, R.N.R., and Lieut. Phillips, R.N.R., during the years 1896 and 1897. Lieut. Rhoades took the lake, and Lieut. Phillips the Upper Shire river. Numerous observations for longitude and latitude have been taken, and many bearings of all noticeable objects recorded. The coast-line of the lake has been very carefully worked out by Lieut. Rhoades. All the longitudes date from that of Fort Johnston. The longitude of Fort Johnston, again, dates from the accepted longitude of Blantyre, as laid down by Lieut. O'Neill.

Arrangements were recently made for the fixing of the longitude of some point on Lake Nyasa by telegraph from Capetown. When this is carried out, it may be found that the longitude of Fort Johnston, as at present given, is more or less incorrect. This will, however, affect the whole lake equally, and, so far as this map is concerned, will merely necessitate an alteration of the values of the degrees as given.

THE INFLUENCE OF GEOGRAPHICAL CONDITIONS ON SOCIAL DEVELOPMENT.[†]

By Professor PATRICK GEDDES.

What the special sciences—mathematical, physical, and organic—have done, and are doing, for physical geography, in interpreting all its phenomena as parts of an orderly unity, as the products and factors of an increasingly intelligible evolutionary process, that physical geography in its turn seeks to do for political geography, taking this in its widest sense. Starting with the more obvious and accepted relations of nature and man, it seeks to elucidate these; correlating, for instance, with their respective physical conditions (as of position and relief, climate and natural resources, etc.), the distribution of races, their economic possibilities and aptitudes, their commercial and military history. But these, again, are obviously related in their turn with social organization and its outcomes. Thus, occupations conditioned by nature have often developed into tribal types or into castes; economic conditions have not only developed distinct types of social organization, but these again have crystallized into political or even religious ones; simple and once natural customs have become established as law or consecrated as ritual; it may be even retained long after their original significance has been forgotten. Hence it is that not only is the historian something of a geographer, and that increasingly so, but the student of language and literature also. All modern schools of thought and criticism have thus become so far geographical, since all are now agreed that not even the highest expressions of human individuality can be adequately studied apart from their physical conditions and antecedents of geographical environment, as well as of race and culture.

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[*] Map, p. 648.

[†] Abstract of Paper read at an Afternoon Meeting of the Royal Geographical Society, May 25, 1898.

Accepting, then, from the physical geographer his description of region by region, and from the anthropologist, the historian, and political geographer, their accounts of the types of man, the races or nationalities inhabiting these, the study of mutual adaptation (of region and race) is, of course, a two-sided one. On one side we have to trace out for each given region more and more completely how far nature can be shown to have determined man. On the other side we have to inquire how far the given type of man has reacted, or may yet react, upon his environment. For such studies there is a wealth of material, though too little systematized, and even of generalizations, though too often incomplete. We need the more and more systematic correlation of each region with its people, of each people with its region; proceeding, of course, from simpler examples towards more complex, and awaiting full comparison before positively laying down geographical and social laws.

In such a resurvey of the globe, we have, of course, a vast mass of literature before us. Not only the observations of travellers, with general surveys like those headed by the "Géographie Universelle," but the interpretations of anthropologists and of sociologists must be utilized. Thus, familiar to most English readers (taking a specific instance, say that of natural selection through climate) must be Pearson's well-known pessimistic view of the future of the white race; taking, again, say the disastrous effects of disforesting, Marsh's 'Earth and Man' will long remain a classic. Among more general attempts, we have Mr. Spencer's 'Sociological Tables,' with their anthropological and historical facts and the corresponding generalizations of his 'Principles of Sociology,' and the more recent works of MacLennan, Stuart Glenie, Payne, and others in this country, with foreign sociologists too numerous for mention here. Not only recent and current literature of this sort, but the works of earlier writers—Ferguson or Gibbon, Buffon or Humboldt, Ritter, Buckle, or Taine—all claim renewed study; in large measure also those of Comte. In this respect, however, the writings of Le Play and his followers, in both schools (the older and more directly practical and economic, represented by "La Reforme Sociale," and the younger and more geographical and evolutionary, represented by "La Science Sociale") are of quite pre-eminent importance and interest; and it is to these that the writer's acknowledgments are chiefly due—to the latter more especially.

Given, then, the planetarium and globe, atlas and relief, given the knowledge of seasons and climates, rocks and soils, plants and animals, we must view our inquiry into the constants of anthropogeography as a higher kind of natural history. Thus the botanist not only recognizes the physical conditions limiting or favouring the plant-life of his region, but distinguishes what he terms plant-associations also. Every one knows, in a general way, that the forest determines its characteristic minor plant-life, and even the animal-life also; but the botanist is only beginning clearly to investigate this in detail, and for each of its dominant types or minor forests. For instance, in our own country, we may proceed upwards (in latitude or altitude alike) through zones characterized by beech and by oak, to that of Scotch fir and finally of birch. We find that each dominant species determines its characteristic surrounding minor flora with its subdominant, solitary, and dependent forms, and their innumerable actions and reactions. These, again, have their characteristic insects, their characteristic vertebrate life also. As the naturalist investigates this "higher physiology," as Mr. Wallace calls it ("bionomics" of Lankester, "œcology" of Haeckel), so it is for the anthropogeographer in turn to continue this into the bionomics of man. How does the forest affect him, determine him? What possibilities of development as hunter or forester, etc., does it open for him? What other possibilities does it restrict or close? The hunter of the Amazonian forests, the lumberman of Canada, the forester of Bavaria, or of the Indian Forest Department, each in his own grade of civilization, is a very definite type, and one surely at least as well worthy of monographic study by the geographer as the gall-insect or the woodpecker, to which the attention of the reflective naturalist cannot be permanently confined.

From the forest we may emerge upwards upon the higher pastures, or downwards upon the deep loamy glade. Beginning with the former, in Switzerland we shall find a drove of cattle, in Scotland a flock of sheep, in Cyprus a horde of goats, each with its own varied and manifold reaction on nature, and each also, and no less distinctly, with its characteristic associated type of man—Swiss herdman, Highland shepherd, and Moslem goatherd, with their widely divergent families and societies, ideas and ideals. To unravel them we must first go eastwards to simpler beginnings, to the great steppes from which have come the pastoral invasions.

The loamy forest glade has yet more varied possibilities and interests. It is the witch's clearing of fairy tale and folk-lore, and for recent anthropology the starting-point of matriarchal agriculture. From these early beginnings, from the mythology of culture-heroines and heroes, we must investigate onwards through that prehistoric golden age of agriculture to which we owe the domestication of most of our plants and animals, if we would understand either of the classic literatures of

Hebraism and Hellenism, with their ideals drawn from water-irrigation, from corn, vine, and olive, from fig tree and from palm. The progress of forest-clearing for pasture and agriculture, and by-and-by for urban and maritime construction also, is thus at first the main progress of the Eastern and Mediterranean lands, but later becomes their ruin. For here may be a factor in the decline of Rome, certainly largely in that of the modern Mediterranean from Spain to Syria—indeed, further east to Persia as well: and thus the interpretation of the Eastern question of to-day is in no small measure associated with the lamentable progress of disforesting. With this human factor we must, of course, also investigate the influence of the cosmic one, the apparently progressive desiccation of the East, to which many would largely attribute the pastoral invasions, perhaps even the earlier Aryan migrations themselves.

Similarly for fish and the fisher: the salmon-fisher of Norway, the whaler of Dundee, the herring-fisher of Yarmouth, the cod-fisher of Newfoundland, the sponge-fisher of the Ægean, each is a definite type, usually at least with characteristic family relations and social outcomes. This is well seen in the contrast of the Scottish fishwife with the Eastern woman in her tent. Again, note the skipper with his definite subordinate hierarchy, whence has come no small element in the strong governments of Western peoples, which can persist almost independently of private moral qualities—witness a pirate crew. Compare this with the weak government of the patriarchal East, which, from the very nature of its pastoral tradition, never succeeds in forming an organization of Western type—or at least in giving it permanence of succession.

Knowing not only such simple and elemental types of society, but their variations with the respective sub-regions they may inhabit, we may attempt the social interpretation of larger and complexer areas. The unit here is commonly the valley region inhabited by all these types—hunter, shepherd, agriculturalist, and fisher, each at his proper level. We have to see how these (1) may evolve or degenerate within their own region, through internal causes, *i.e.* the qualities and defects inherent in their particular social formation; and (2) how they act and react, how they combine with, transform, subjugate, ruin, or replace each other in region after region; and we may thus re-interpret the vicissitudes of history in more general terms, those of the ascending and descending oscillations of these social types. For at one time irrigation and intensive culture ascend the valleys, and its cities flourish and increase; at another the hunters and shepherds descend upon the plain, sometimes as a ruling race or caste, sometimes as a replacing one. In this case, the consequent diminution of food-yield per acre involves a corresponding reduction of population, from which cause, and not from any special ferocity, come the massacres which stain the history of all pastoral conquests, and form so perplexing a contrast to the gentleness and hospitality natural to shepherds in their natural home.

In the same way we may come to interpretations nearer home. In Scotland, with its varied individuality, its exceptional conditions of geographical isolation, not only of highland clans in their glens or borderers in their dales, but even of town from town, each upon its fortress-rock or fiord, we must proceed to distinguish the thrifty agricultural Saxon of the Lothians, the adventurous Scandinavians of the Northern and East Coast, the pastoral and imaginative Celts, and the social as well as racial hybrids of all these (the "Kelto-Viking" perhaps especially), before we can understand the heterogeneous variety of Scottish history and literature, much less interpret qualities and defects of social life.

So far an outline of the general method, its more precise application to societies and their environments is necessary, alike to the simplest societies and to the more complex. We may thus both test and develop our developmental method of interpretation, here upon the descriptions given by travellers of simple and complex societies from polar to tropical lands, or there upon the complex phenomena of contemporary evolution in our familiar record of current events, the morning newspaper (which becomes more and more of a popular journal of geography), ultimately, of course, reaching the well-ordered exhaustiveness of monograph.

Among many examples of interpretation of detail might be cited the observations of Nansen in Greenland, or of Thomson or other travellers in China; though, as regards the vexed question of method for monographing, in justice to the elaborate proposals of various schools, a full and separate survey is required, which would far exceed the limits of the present paper.

As a suggestive and convenient working outline, the following simple diagram may be recommended. Summarizing the doctrine above outlined as—

$$\text{Place} \longrightarrow \text{Work} \longrightarrow \text{Family}$$

these may be conveniently taken as the headings of as many parallel columns, within which we may summarize the main facts of each, so far as we can trace their sequence and interdependence. Taking, of course, a fresh sheet for each region or social type studied, comparisons of regions and races become more easy.*

Difficulties of course arise, and stimulate the development of this too simple outline. Thus, apart from the economic and material phenomena, it becomes necessary to distinguish, yet to parallelize the intellectual, moral, or other subjective aspects. Both needs may be broadly met by a simple convention—that of tabulating the objective phenomena upwards in our three columns, the subjective phenomena downwards; their distinctness of aspect, yet their permanence of association, becomes thus apparent, such subjective phenomena as are clearly dependent upon the material evolution of society being alone thus treated.

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* A striking example of regional interpretations on this principle is afforded by the recent work of M. Demolins, 'La France Contemporaine" (Paris, 1898).

But this treatment of many intellectual and even moral considerations as simply derived from economic conditions at once leads to a corresponding clear statement of the converse one. For while circumstances modify man, and that in mind as well as body, man, especially as he rises in material civilization, seems to escape from the grasp of environment, and to react, and that more and more deeply, upon nature; at length, as he develops his ideas and systematizes his ideals into the philosophy or religion of his place and time, he affirms his superiority to fate, his moral responsibility and independence; his escape from slavery to nature into an increasing mastership. For this view the parallel tabulation of facts is also possible, and that by simply reversing the previous diagram. The headings therefore read—

Society ⟶ Work ⟶ Place
(Ideals and
institutions
of family)

and the two aspects of each society then contrasted, like the Dr. and Cr. sides of an account. Concrete examples of this are being prepared for subsequent publication.

Such being the general idea, its development is in progress amongst many workers. So far as the writer and his colleagues and pupils have been concerned, their centre of teaching for the past seven or eight years has been the Edinburgh Summer Meeting, held annually in vacation-time; but is now permanently in the "Outlook Tower" of Old Edinburgh,* which is being arranged as a type-museum and observatory, alike of physical and of political geography. This is comparatively arranged, as far as may be, through its descending storeys (of Prospect, City, Scotland, Empire, Europe, World) on one hand in harmony with this conception of the unity and continuity of the natural with the social sciences; and on the other with the application of geography, thus unified and rationalized, to the comprehension and the conduct of practical affairs at every corresponding level—local or civic, regional or national, imperial or cosmopolitan. Taking the general summaries of geographical facts afforded by the great atlases and descriptive works, and imagining these unified and co-ordinated in a vast and simultaneous survey, such as that aimed at in the Great Globe of M. Élisée Reclus; this tower is readily understood as its necessary complement for any given region, since this for its inhabitants is necessarily both the starting-point and the returning point of even their widest thought and activity; it is the centre of their ideas and their practical life alike, for which no merely general and impartial world-survey is sufficient. Hence Education, if real, begins with a Regional Survey, as action with a regional usefulness. Hence such a regional type-museum and school of reference has to be not only geographic, but geotechnical. In the very difficulties of coping with the vast and perplexing division of labour, alike in science and in practical life, it finds its necessity and its justification as at least an attempted clearing-house of education, in which all specialisms may again meet. For it is not enough to postulate order and unity in nature, though that is the necessary and constant working assumption even of the most narrow specialist within his own field; we must demonstrate it in detail, and apply it in detail also. For if the evolutionist's promise of scientific synthesis is to be justified, it must descend from the region of philosophic abstraction to co-ordinate and interpret the whole facts of geography and history in that widest sense, in which these are no longer much neglected sub-sciences, but the all comprehensive account of the evolution of nature and human life throughout space and time.

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* Since described in fuller outline at the geographical section of the British Association. See abstract in 'B.A. Report (Bristol), 1898.' Proceedings of Section E.

The PRESIDENT: I now invite discussion on Prof. Geddes' paper. Perhaps Mr. Ravenstein would commence the discussion.

Mr. RAVENSTEIN: I feel quite sure that all those who have occupied themselves with similar questions will have agreed with much that Prof. Geddes has told us, and they certainly have appreciated the very interesting manner in which he has placed all these things before us. In discussing this dependence of men upon their surroundings, we must not go too far—and Prof. Geddes himself has said this—in concluding one thing from another; in concluding, for instance, that assassination must be traced to the occupation of some of our forefathers. We should be very careful about that. What I should like to say—and it is a thing many others have said—is, Do not be too sure about geographical environment. Undoubtedly it is a great influence, but we must not allow ourselves to be too much influenced by it. For instance, if we attempt to cultivate plants on an arid soil that require a rich soil, we are punished, and as we do not like being punished—and as mankind, take it at large, after all learns from experience—we avoid repeating those mistakes in order to escape the punishment. A specialist one day said, speaking about Ireland, "Certainly the Irish have been influenced by their insular position, but I do not say that if Ireland had been occupied by Anglo-Saxons its history would have been different."

Mr. J. A. BAINES: As I came here simply as a learner, and have not examined the diagrams, I feel that I can contribute little to the discussion. I should like to be in a position to ascribe more importance than I do at present to the influence of geographical conditions upon social development, but so far as I have studied the matter, I find no ground for such broad conclusions as those stated. No doubt these influences are of great moment in the primitive stages of society, but with the advance of civilization they tend to disappear, and the influence of man on his environment increases. In fact, a good part of the lecture may fairly be taken as a sermon on the text of "*Ce coquin d'homme restera toujours le même.*"

Dr. MILL: What strikes me most with regard to the subject of Prof. Geddes' paper is, that it is a matter for further research. If the conditions on which the conclusions arrived at in the paper are based could be investigated in a more general way, and with the direct object of discovering how far those principles can be justified and extended, it would be a very good thing. Hitherto geographical research has been carried on very much in a haphazard way. Different travellers and explorers, and also a few theoretical men, have studied the subject without knowing exactly what they wanted to find out, but if they had before them some such definite thesis as that which Prof. Geddes has laid down, I think a very great deal of information would be gathered.

The President: As no one else wishes to speak, I should like to say a few words on the importance to travellers of the remarks in Prof. Geddes' paper. I should hope that pains will be taken to draw the attention of young travellers to the conceptions which are set forth in Mr. Geddes' paper and his diagrams with reference to the effect of food upon animals and upon the inhabitants of different countries, and to the effect and reaction of the inhabitants upon the vegetation, and what effect that has had upon them. I believe that the inhabitants have improved the physical condition of some countries, but I also believe that they have done ten times as much harm throughout the world as they have done good, and the consequence has been, no doubt, that there have been retrograde changes in their habits and in their progress. I have not had time to study with any care Mr. Geddes' paper, and I therefore do not venture to say more on the subject; but I have been much fascinated with the ideas which are conveyed to students in that tower (referring to diagram), and I hope some day to have the pleasure of visiting it in Edinburgh, and of studying the method of Prof. Geddes in teaching his pupils. I am sure the meeting will wish to return a very hearty vote of thanks to Prof. Geddes for a very interesting and suggestive paper.

Prof. Geddes: If I may say a single word, it is that I would ask any who are interested in this thesis, and are disposed to follow it further, to begin in the remoter corners of the earth, not in London or Paris; but to begin in the isolated places in Scotland, in Cyprus for instance, where one gets a much more real and clear view of these things naturally than one can get here on the great English plain. It is as with geology, one must go to the places where geological facts are obvious.

MR. SAVAGE LANDOR'S TRAVELS IN TIBET.—A REVIEW.[*]

By Colonel Sir T. H. Holdich, K.C.I.E., C.B., R.E.

The geographical results of Mr. Savage Landor's gallant but unsuccessful attempt to reach Lhasa from the Manasarawar Lake region are comparatively unimportant. It was impossible that they should be otherwise. The country that he succeeded in traversing was not altogether a *terra incognita*, for that interesting lake region (the fountain-head of the biggest river systems of India) which centres in the twin lakes of Rakas-tal and Manasarawar, has been visited by Europeans before Mr. Landor's time, and the route from the lakes to Lhasa has been traversed by a well-trained *employé* of the Indian Survey, who travelled at his leisure, and mapped the topography of the district with painstaking care. We are indebted chiefly to the brothers Henry and Richard Strachey for our mapping of the two lakes, and those gentlemen are the authorities for that connection between the lakes which is shown in some maps, and should be shown in all. It was obviously impossible for a traveller so hampered with difficulties, and so restricted in his movements as Mr. Landor, to do full justice to the training which he had received at the Royal Geographical head-quarters in England, or to make full use of the instruments which the Society had lent him; so that he could hardly hope to supply the Society with material good enough to justify any fresh departure from the results attained by such scientific observers as the Stracheys, or the trained experience of "the Pundit." The maps which he has brought back do not differ materially in topographical detail from those with which he was supplied on his outward journey, and the record of observations consists mainly of a traverse which, when projected, can only be reconciled to the maps with difficulty. Observations for latitude, longitude, and altitude, are much wanting, especially the latter; for it is not easy to understand on what system the heights recorded on his map were either derived or computed. That Mr. Landor should have found it difficult to keep an accurate scientific record, or to take valuable observations, is not at all surprising; but he has fallen into the inexcusable error of making a positive assertion about the physical conformation of the lake surroundings without having actually traversed the ground to which he refers. He states that there is no connection between the Manasarawar and Rakas-tal, but he failed to push his exploration right across the intervening ridge so as to ascertain positively whether there was, or was not, such a connection. Every one knows that it is difficult enough to detect a ditch traversing a flat field until you come to the edge of it. When the field of view is not flat, but very much the reverse, the difficulty becomes an impossibility. Now the connecting "ditch" between the two lakes has not only been seen, but has been sketched, by Sir Richard Strachey; and it is to be hoped that ere long that thoroughly practical as well as scientific observer will give the Society the benefit of his observations in a fuller and more complete form than have as yet been available. The inevitable conclusion meanwhile is that Mr. Landor did not go far enough to see that connecting link, and that it would have been better had he not been quite so confident in the expression of his opinion.

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[*] "In the Forbidden Land." By A. Henry Savage Landor. 2 vols. Heinemann, 1898.

ACCLIMATIZATION OF EUROPEANS IN TROPICAL LANDS.*

By Dr. L. WESTENRA SAMBON.

The problem of tropical colonization is one of the most important and pressing with which European states have to deal. Civilization—by mitigating famine, war, and pestilence—has favoured unlimited multiplication, and thereby intensified that struggle for existence the limitation of which seemed to be its very object. The Old World would be unable to support its ever-increasing population if the balance were not kept by a constant flow of emigration, which fluctuates from year to year with the tide of social misery. This continuous dispersion has replaced the swarmings of savage life, when tribes of men were subject to such periodical migrations as are witnessed in the northern grey squirrel and the Norwegian lemming. I know full well that the question of emigration is beset with a variety of moral, social, political, and economic difficulties; but it is the law of nature, and civilization has no better remedy for the evils caused by overcrowding.

Looking for suitable areas whither to direct the torrent of our surplus population, we find that in the temperate zone there is no longer room for any great further immigration. Already North America and Australia resist the free immigration of paupers. But there remains the great tropical belt, with its vast and rich territories extending over more than a third of the surface of the globe. This, surely, must be the Promised Land; but we dare not enter, because at its gates stands a terrible monster—the Cerberus of prejudice.

It is the almost universal opinion that the European cannot colonize the tropics, but must inevitably fall, sooner or later, a victim to the influence of their deadly climate. I will endeavour to prove that this statement is wrong, and that there is no reason why the European should not conquer the tropical world.

The pessimistic opinion in regard to the tropical climate arose at a time when scientific knowledge was in its infancy, and when the enormous death-rate of Europeans, tenfold higher than that of the natives, seemed to prove beyond doubt that in the struggle for life in tropical regions the European was defeated. Within the last few decades, under the influence of sanitary science, wonderful changes have been wrought in the healthiness of tropical stations, and the changes have in many instances been so great that places which were considered the deadliest are now recommended as health-resorts!

In the light of new facts, the old theories were bound to crumble; but, strange to say, they still dominate public opinion. If the question of acclimatization has not closely followed in the train of modern thought, it is because of its complexity. It has hitherto been discussed mostly by statesmen, geographers, meteorologists, and journalists, who were bound to base their conclusions on such medical opinion as was accessible to them, no matter how obsolete and erroneous. Now, the medical aspect of the question is by far the most important, but, unfortunately, the one that has been most neglected, perhaps because we have necessarily more practitioners than scientists in the medical field.

The general opinion is that intertropical regions are inimical to the European on account of their climate. I will show you that this is not so; but, first, we must understand what is meant by the word "climate," because authors, when writing on tropical acclimatization, do not use it in its broad accepted meaning, but merely as a synonym of heat. According to them, the tropics are deadly because of their heat. Now let us consider this statement very carefully, because it is the pivot of the whole question.

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* Paper read at the Royal Geographical Society, April 27, 1898.

Those who believe that the heat of the tropics is noxious to Europeans, uphold their contention by stating that it induces disease, and they mention anæmia, hepatitis, and sunstroke. At one time, undoubtedly, these diseases were attributed to the direct and sole agency of solar heat, just as malarial fevers were attributed to the moonshine; but now they have been inscribed deeply on the tablets of bacteriology, and certainly the demonstration that disease belongs to the domain of parasitism is the greatest advance that medical science has ever made.

Anæmia, in the tropics, has been considered one of the most obvious consequences of heat. Some authors thought it a normal and protective condition, and went so far as to induce it in new-comers by venesection. Dr. Felkin called it *physiological anœmia!* But anæmia, in the tropics as in Europe, is a morbid condition of the blood common to several diseases, such as malaria and anchylostomiasis. It is never induced by heat. The observations of Maurel, Marestang, Eijkman, and Glogner have proved beyond doubt that in tropical regions the influence of high temperature causes no change in the amount of red corpuscles or hæmoglobin in the blood.

The various diseases of the liver common to Europe are also met with in tropical countries; but there the accepted etiology is forgotten, and they are curiously attributed to heat. The frequency of liver abscess in tropical regions has been advanced as a proof that it is caused by heat; but its limited and peculiar distribution, altogether independent of climatic conditions, is strongly against the meteorological theory. The frequent association of liver abscess with dysentery has led authors to believe that it may be due to the same parasite which causes the latter, and the *amœba coli* has been incriminated in both diseases.

The parasitic nature of anæmia and hepatitis having been generally recognized, sunstroke remained as the only condition that authors could bring forward to prove the noxious influence of tropical heat. But I firmly believe the febrile distemper called sunstroke in India to be an infectious disease (see *British Medical Journal*, March 19, 1898). My statement appears at first paradoxical, but it is far more surprising that the disease should have remained so long in the domain of astrology. The reason is perhaps that it was confounded with diseases and conditions of a very different nature, such as cerebro-spinal fever, pernicious malaria, cerebral hæmorrhage, alcoholic coma, and syncope, and because its mistaken nomenclature perpetuated an erroneous preconceived causation.

So-called "sunstroke," for which I have adopted the older and more appropriate name siriasis, is an acute disease characterized by intense fever, loss of consciousness, and embarrassed respiration. Its symptoms and post-mortem appearances are analogous to those of infectious diseases. Its onset is often sudden, as in cholera or plague, but usually it is preceded by premonitory symptoms, which indicate clearly a period of incubation. The frequent occurrence of relapses is another strong proof of parasitic nature. Like enteric fever and other infectious diseases, siriasis is closely connected with the hottest season; but—and this is a most important feature—it has a peculiar and restricted geographical distribution, which is not bound by isothermal lines, but, like that of yellow fever, is limited to a few coast districts, and to the valleys of some large rivers. Moreover, siriasis often prevails in epidemic form, and naturalization confers immunity to it, as it does to yellow fever.

All this may be very well, but theorists will not yield, and, not being able to offer any definite proof of their contention, they will tell you that the tropical climate induces deterioration. They remind me of squids and cuttle fish, which, being unable to fight their foes, cloud and darken the water with their ink as a means of defence. Most authors have mentioned a peculiar tropical deterioration, but no one has ever described it in definite terms, because no one has ever seen it. Heat deterioration is a phantom that is vanishing rapidly in the light of modern science. Of course there are thousands of people within the tropics, both Europeans and natives, who show signs of bodily decline and of general debility, but in all these cases we can trace the deterioration to definite microbic processes. Deterioration in the tropics, as in Europe, is that condition of organic failure which is characteristic of long-continued (chronic) diseases such as tuberculosis and leprosy.

Two great causes of deterioration in tropical regions among Europeans are malaria and tuberculosis. Malarial diseases have a very wide distribution within the tropics, but their prevalence varies exceedingly in different regions. Some districts enjoy a complete immunity from malaria, notwithstanding the existence of climatic conditions which might be thought favourable to its prevalence. In others it is so greatly prevalent that the whole population suffers from malarial cachexia (chronic malaria). Tuberculosis is not a tropical disease, but it has been imported by Europeans to all colonies, and in some places it has become extremely prevalent. In the West Indies it causes now more deaths than any other disease, except dysentery. But most cases of tuberculosis amongst Europeans have not been contracted in the colony, but are outbursts of a latent infection contracted at home during childhood.

Deterioration is not limited to Europeans in tropical regions, but is equally prevalent among natives. The chief causes of deterioration among natives are leprosy, malaria, and tuberculosis; but the deterioration due to tuberculosis is far less prevalent than among Europeans, because in most places it is still rare, or confined to coast districts, and because when it attacks the natives it is rapidly fatal.

In Europe we find the same causes of deterioration, but with a very different prevalence. Malaria once prevailed extensively, but it has gradually disappeared, except in a few places, the chief of which are Southern Russia and certain parts of Italy. Leprosy was also prevalent in Europe as an endemic disease during the middle ages; now there remain only a few small centres, and even in these it is fast decreasing. On the other hand, we have the appalling deterioration caused by tuberculosis, rickets, and syphilis. The deterioration of the white man in his own climatic home has caused much discussion of late, and, indeed, it is deserving of urgent and serious consideration. Broad chests and powerful limbs are no longer common among labourers and artisans. The medical examiners of recruits reject a larger proportion every year, and those admitted into the ranks are certainly inferior to their predecessors. This deterioration is greatly favoured by the herding together of dense masses of population in large cities, a more strenuous struggle for existence, alcoholism, and immorality. In almost all nations, organic ruin is slowly progressing as the old country life is being merged into the miserable life of cities. The birth-rate in England, France, Germany, Holland, and Belgium shows a marked decline coincident with the increase of urban population; and, if we compare the mortality of the rustic labourer with that of the corresponding class in towns, we find that the countryman enjoys a life on an average three times as long as that of his metropolitan brother. Surely not over our colonies, but at the entrance of our cities, should be written Dante's inscription, "Lasciate ogni speranza, voi ch'entrate."

The present pessimism on the question of the tropical acclimatization of Europeans has a parallel in that which was so strongly expressed by Dr. Knox and others about the English transplanted to the United States and to Australia.

In studying the question of heat as a cause of disease, it will not be out of place to consider the influence of high temperature on workmen in Europe.

Carpenter, in his physiology, tells us that Chabert, the "Fire King," was in the habit of entering an oven the temperature of which was from 400° to 600° Fahr. Other examples equally surprising, and certainly less suspicious, are on record, but, however interesting, they are of little value to us, because such extremes of temperature can only be endured for a short time, and provided the air be dry. Far more important is the study of some of our workmen who toil day after day exposed to far greater heat than ever raged in a tropical settlement. Metal-casters, glass-blowers, stokers, men employed at Turkish baths, and labourers in certain mines, occupy certainly a low place in tables of vital statistics, but they don't seem to suffer in any special way from the heat. Their diseases are certainly not those prevalent in hot countries; they die chiefly from rheumatism and tuberculosis.

If the diseases of the tropics were due to meteorological agencies they would surely be especially prevalent amongst sailors; but we know, on the contrary, that tropical diseases are characteristically land affections. The crews of ships sailing in tropical latitudes are strikingly exempt from them. When they do occur among seamen they are found invariably to have been contracted on shore, or introduced on board ship by means of food, drinking-water, or other supplies. Of course some diseases, like yellow fever, malaria, siriasis, may be conveyed to ships through the air by means of insects or dust; but this usually occurs only at short distances, when they are anchored off unhealthy shores. Ships may become independent centres of disease, especially when infected by yellow fever or beri-beri; and they may then convey diseases from one country to another, and land them by means of their crews or their cargoes, and possibly by means of rats, which, finding their way into almost every ship, land on almost every shore.

In speaking of climate, we must not forget that between the tropics there is not one climate, but an infinity of climates. Hardly any two places a few miles apart have precisely the same climate. Climates do not depend on the geographical position of the district where observations are made, but are largely affected by a variety of conditions, such as distribution of land and water, nature of the soil and vegetation, elevation or depression, and character of the land at or adjacent to the place.

Now, this very local character of climate has been advocated to explain why tropical diseases differ in nature or prevalence in various regions, but it falls very wide of the mark. In all tropical regions each district maintains its natural peculiarities of climate year after year; if these peculiarities were the causes of disease, the yearly quotum of malaria, dysentery, cholera, yellow fever, etc., of different districts should vary with the intensity of these conditions. Yet statistics furnish no support to this necessary sequence; on the contrary, we see diseases diminish or increase in prevalence quite irrespective of climatic conditions. Enteric fever in India has lately become more prevalent; cholera and dysentery have greatly decreased. The introduction of new diseases, such as malaria, in the islands of Mauritius and Réunion, has spoilt regions which were previously healthy; on the other hand, sanitation has rendered salubrious regions which at one time were deadly.

In a paper published last year in the *British Medical Journal*, I endeavoured to show that it was not heat that opposed tropical colonization; but it is with living organisms, from man, wild beasts, and snakes to protozoa and bacteria, that we have to struggle for existence. In India about 23,000 people and 60,000 head of cattle are killed every year by snakes and wild beasts, but no one would dream of putting those deaths down to climate. In Australia, since the introduction of sheep and dogs, echinococcus disease has become greatly prevalent, but even in this case no one would attribute to climate the ravages of this worm. Why, then, should we make climate responsible for the mortality caused by other organisms, even though they be the lowliest in the scale of life and invisible to the naked eye?

In some of the regions that the European has attempted to colonize he has found the native to be a fierce opponent, but the greatest, the longest struggle is always with the lowest forms of life. The most fearful arrow is that which is smeared with soil containing the bacillus of tetanus. In Equatorial Africa a fly (*Glossina morsitans*) drives man away from certain districts by killing his domestic animals, and its poison is the deadly parasite trypanosoma, which it inoculates. In the French expedition of 1896 to Madagascar, only seven men were killed by the Hovas, and ninety-four wounded; but the deaths due to pathogenic micro-organisms numbered 6000, while 15,000 men were on the sick-list. In the expedition of 1802 to Jamaica, the French lost no fewer than 50,000 out of 60,000 from the germ of yellow fever.

A knowledge of the distribution of tropical diseases is of the utmost importance in the study of colonization. Unfortunately, geographical pathology is as yet in its infancy. Pathogenic micro-organisms have their peculiar dissemination like all other forms of life, and their distribution is likewise determined by a number of circumstances. Amongst these, meteorological and soil conditions occupy certainly an important place, but the most important of all are association and competition with other living organisms.

Running through tropical pathology, as far as it is known, we are struck with the peculiar limitations which most diseases offer. Some have a very limited area: verruga seems confined to some valleys of the Peruvian Andes, negro lethargy is found only in the west of Africa, endemic hæmaturia has a very limited area of distribution in Africa and Mauritius, and even the germs of yellow fever, plague, cholera, and dengue have restricted endemic areas, though at times, under favourable circumstances, they seem to swarm like locusts, and spread in wide epidemics.

Round the main error that the tropical climate is deadly to Europeans, other superstitions have gathered; they are, that children cannot thrive in the tropics over five years of age, that white men cannot work, that their fertility is abolished, that they become extinguished within the third generation. At one time, of course, these statements seemed the most logical deductions of facts, now it seems almost absurd to discuss their fallacy.

It is not true that children cannot thrive in tropical countries. Thirty years ago, Sir Joseph Fayrer conclusively proved, from the experience of the Lawrence Orphanage, that, under proper management, children could thrive in India as well as in England, not only in the hill stations, but in the very plains of Bengal. The general opinion as to the unsuitability of a tropical climate for children over a certain age is derived mostly from Indian experience. I know full well that a number of European children brought up in India grow up slight, weedy, and delicate; but this is easily explained—they usually come from poor stock, principally soldiers' wives, whose health, mostly poor before leaving home, certainly does not improve in the country on account of ignorance and neglect. The children are often brought up in unhealthy districts and are very foolishly managed. For fear of diseases, wrongly attributed to solar influence, they are constantly shut up in stuffy and darkened houses. Under similar conditions, believe me, they would thrive no better in England. Surely those who lay so much stress on the weakly condition of European children in India have never seen the bandy-legged little monsters of Glasgow, or the sickly, miserable children that swarm in darkest London.

In considering the question of European children in tropical countries, we must not forget that infant mortality varies greatly in different colonies; that it is always lower than that of native children; that in the most unhealthy regions it is lower than that of many districts in Europe; and lastly, that under improved sanitation it has fallen considerably.

The belief that the white man cannot work in the tropics arose greatly from the assertions of the advocates of coloured labour. It is certainly disproved by facts. Farm labour is carried on by white men in Central and South America, in tropical Australia, in South Africa, in the West Indies, and in India, with no worse consequences than in temperate regions. The malarious districts of the tropics are no worse than those of the temperate zone. In England, malaria has almost entirely disappeared, but in Italy it is still deadly to the labourers of the Roman Campagna and the ricefields of Lombardy. In India the farmer may be killed by cholera or be mutilated by leprosy; in England he is carried off by pneumonia or crippled by rheumatism. The turning up of a virgin soil in certain localities may be dangerous. Hong-Kong was especially unhealthy during the first years of occupation, when the ground was being cut up and levelled for building purposes, and it has been observed again and again in different countries, and sometimes in our large cities, that extensive disturbance of the soil in connection with canals and railroads may, perhaps by disturbing soil drainage, give opportunity to an outbreak of disease.

But, with the exception of low swampy districts, experience in all tropical regions has proved that white men are far more healthy when engaged in outdoor labour. The truth about the labour problem is that white men will not work; they go to the tropics with a fixed resolve to gain wealth by coloured labour, which only too often is another word for slave-labour. However, it is certain that Europeans will not work side by side with natives, and wherever coloured hands can be obtained, field labour is considered degrading and unworthy of the white race.

As to sterility, we find no direct evidence to prove it, but, on the contrary, we have many examples of continued and even increased fertility. Thus the Spaniards, who in their own country have a yearly birth-rate of 37 per 1000 inhabitants, have one of 41 at Cuba, and one of 46 in Algeria. The French offer a birth-rate of 26 at home, and one of 41 in Algeria.

It has been asserted that white men cannot exist longer than for three or four generations in the tropics. It is not easy to obtain facts in large numbers to disprove this statement, because in most places the time of occupation has not been long enough, and in others there has been more or less admixture of native blood or fresh blood from Europe has continually arrived throughout the period of settlement.

Sir Clements Markham, in a valuable paper which he read at the Seventh International Congress of Hygiene and Demography, gathered all the available information, much of which he had carefully collected himself, and proved that families of pure European blood had been settled for upwards of two centuries in places within the tropics, and that in each case the living representatives were quite equal to their progenitors in moral and physical development.

Not long ago, it was the general belief that each species of animal or plant had been created in the beginning in those very areas in which it is now found; but the principles of evolution have swept away these old preconceptions. We know now that the surface of the Earth has continually changed. Land has sunk beneath the ocean, fresh land has risen up from it destitute of land-life; mountains have been elevated, altered, crumbled; the physical conditions of districts have been modified again and again. Organic life has therefore been subject to continuous displacement and alteration. But, even independently of topographical changes, we know that plants and animals are continually altering their areas of distribution in the daily struggle for life. It is difficult to realize what changes have taken place in the vegetation of Europe since the dawn of civilization. They must have been very great, but we have no complete history of them. It is otherwise with some of our colonies. Take New Zealand, for instance. Its native flora was investigated before it had been much disturbed by European immigration. The changes which have taken place during the short period of European occupation, are almost incredible: over five hundred species of exotic plants have become naturalized in New Zealand, and many have become so abundant in certain districts that they have displaced the native plants.

Some plants, when first introduced into a new country, seem unable to thrive, but we must not rush too hastily to the conclusion that the new climate is not suitable. If we could only know all the facts which bear on the case, we should probably find the reason to be a very different one. The red clover would not grow in New Zealand until bumble bees were introduced to fertilize its flowers; now it displaces the native grasses. Leguminous plants will not thrive in a soil which does not contain their peculiar nodule-bacteria. Botanists have sown the seeds of many hundreds of species of exotic hardy plants in what appeared to be the most favourable situations, but very few have ever become acclimatized. This proves that competition and association with other forms of life are far more efficient agencies in determining their distribution than the mere influence of climate.

What we have said of plants is equally true of animals. If we inquire into the origin of our domestic animals, we shall find that twelve of them came from Asia, two from Africa, and three from America, while only five are European. Again, we have successfully acclimatized in America and Australia those animals which had previously been acclimatized in Europe from Asia and Africa. There were no sheep in America and Australia, now their number is simply countless. Horses and cattle have thriven marvellously in South America. In New South Wales horses have turned wild, and have increased with alarming rapidity. The rabbit, introduced into Australia and New Zealand, and the sparrow in New Zealand and the United States, have grown into pests of appalling proportions.

Thousands of examples might be given from the animal world; the latest is, perhaps, the invasion of Europe by the brown rat from East Central Asia, which has practically expelled the black rat from Europe, just as the latter has been ejecting weaker rodents from South America.

Thus we see not only that plants and animals can become naturalized in other climates, but that they have often prospered better in the new environment than in that of their original habitat, altogether disproving the old theory that each species occupies those districts and surroundings best suited to its life.

Turning to man, we find that anthropologists have divided mankind into several races, which, according to individual authors, have varied from three (Cuvier) to fifteen (Bory de St. Vincent). These races were formerly considered quite distinct ethnic groups, and were believed to have originated independently of each other; but now the unity of the human species has become an accepted fact, and we again believe, as Hippocrates did two thousand years ago, that "races are the daughters of climates."

Man, anatomically and physiologically a mammal, is subject to the same laws which govern all other forms of life, and therefore he must have had a restricted primitive area. To suppose that he appeared in the beginning, everywhere that we now see him, would be to make him a unique exception; and, in the absence of direct proof, we should have to deny it. However, it is an undisputed fact that widespread migration and consequent acclimatization have taken place in all times, and the researches of ethnologists to-day are continually bringing new evidence.

The whole history of mankind is one of invasions and displacements, one restless movement of individuals and masses. The swarms of colonies thrown out by Phœnicia and Ancient Greece, the Slavonic and Teutonic flood which swamped the Roman empire in the fifth and sixth centuries of our era, and the wanderings of the vast Mongolian hordes in more recent times, are good examples. These migrations followed in every possible direction along the lines of least resistance, generally along river-valleys and across the lowest mountain passes. They moved very rarely northward, and only under the irresistible pressure of stronger neighbours. Often they followed the parallels of latitude, but mostly they tended in a southward direction to warmer and richer regions. The emigrants usually settled in climates not greatly different from that to which they were accustomed, but there are exceptions: the Vandals settled in North Africa.

In following up the evolution of some of the swarms of men which settled a few centuries ago far from their ancient seats, we find that they have fallen under the same laws which govern the dispersion of all organic beings; thus, according to circumstances more or less favourable, while some people have totally disappeared, others have continued to exist. Of the latter, some have been greatly transformed by the new conditions of life, and by mixing and crossing with local people, others have hardly changed, and have succeeded so well that they have assimilated, displaced, or pushed wholly out of existence the former occupants. Thus in India, while the Rohillas, the Rajpoots, and the Parsees of Aryan race have remained unchanged after centuries, the Portuguese of Bombay and Goa have altered immensely, and are now as black as Kohls or Bhils.

Now, if Aryans of remote immigration have not only been able to thrive, but have even absorbed the semitic dwellers of India, why should the Aryan of to-day be unable to colonize even those parts of the great peninsula which have been called "the English climates of India"?

The French thought at one time that they would never be able to thrive in Algeria, although descendants of anciently immigrated Aryans are still to be found in the province of Constantine and all along the Atlas from Mount Aures to Morocco. The climate of Algeria was considered deadly to Europeans. General Buvivier declared "que les cimetierès sont les seules colonies toujours croissantes en Algerie." Now we send invalids to Algeria, many of its places having obtained the reputation of excellent sanitaria!

The Red Indian inhabits the frozen wastes of Hudson bay and the hottest regions of tropical America. In the Republic of Ecuador, he thrives at a height of 12,000 feet on the Andes, and in the low plains at their western base. But if the red man can do this, why should it be impossible to the white man, who certainly has greater facilities of accommodation? The Jews have succeeded admirably in climates very different from that of their native land. They thrive just as well in Poland as in South Africa. The Spaniards and Portuguese have become completely naturalized in some of the hottest parts of South America. The death-rate of the Spaniards in Cuba is less than in Spain.

The Dutch have prospered in South Africa and in the Moluccas. At the Cape, where they have been settled and nearly isolated for about two hundred years, they have hardly changed. They are fair, tall, and robust. Indeed, they are the finest men in South Africa.

It has been often repeated that the southern European nations stand a better chance than the northern ones in the colonization of tropical lands. Prof. Virchow suggested that the reason might be a certain amount of semitic blood, and Dr. Felkin the greater proximity of their home to the tropical zone; but the south Europeans can not only endure more heat, but also greater cold. It was remarked by the famous Larrey, that in Napoleon's campaigns, whether in that of 1806–7 or the later disastrous one of 1812, the troops which endured the cold best were not the northern ones, but the southern, such as the Spaniards, Italians, and southern French.

I believe that the greater adaptability of southern Europeans is mostly due to influence of national habits. The Italians, the Spaniards, the Portuguese, like the Irish, the Jews, the Chinese, show a great facility of accommodation by reason of their frugality and perseverance.

The most important, the essential condition of acclimatisation is the acquirement of immunity against new diseases. It is the general belief, in all tropical countries, that new arrivals must pass through an attack of a seemingly specific fever which is supposed to be essential to acclimatization. I need not point to the absurdity of this statement, but it is certainly true that new arrivals are far more susceptible to the peculiar diseases of a place than the natives or old residents, and this is especially so in reference to siriasis and yellow fever. At Vera Cruz, the magnitude of an epidemic of yellow fever depends entirely on the number of new arrivals.

New arrivals show towards the diseases of a new place the same susceptibility that the natives show towards a newly introduced disease.

A great deal has been written about racial immunity, and that of the coloured races from malaria was once considered as an indisputable fact. More recent observations have proved that differences are usually small, and mostly unfavourable to the natives. On the other hand, it is frequently stated that the dark races are more liable to elephantiasis than the white. This is undoubtedly true in some countries in which Europeans live a more hygienic life, and are more careful about the water they drink. But when whites assume the habits of the natives, they are quite as liable to acquire elephantiasis, as Indian and Brazilian experience has proved.

We know as yet nothing positive as to the mechanism of immunity, and it is certainly not correct to state indiscriminately that it can be transmitted by heredity. Facts from experiments are mostly adverse, and moreover, of the diseases which confer immunity, it would be difficult to name one in which a second attack might not occur. Much of the immunity of natives is only apparent, because we must not forget that those we meet are the survivors. Therefore, I believe we can safely state that the immunity of the native is not a natural (racial) but an acquired immunity, and that the colonizer can acquire it just as well.

To acquire immunity, it is not necessary to suffer the disease in its full development. Laboratory experiments have shown us that the inoculations of small quantities of bacteria, though not producing all the symptoms of the disease, nevertheless confer immunity to subsequent more abundant inoculations, which, if practised in the first instance, would have produced the disease in its worst form and caused death. The same happens in nature. We are constantly struggling against disease germs, and we acquire immunity against them without even being conscious of having been attacked. Sanitation, preventing the swarming of pathogenic germs, by the maintenance of conditions unfavourable to their development, will greatly reduce the possibility of overwhelming attacks.

Authors generally maintain that sudden transference to an extreme climate is unfavourable to acclimatization. The ancient migrations of primitive people were necessarily accomplished step by step, and the wanderers accommodated themselves gradually to surroundings which differed but little from those they had previously left. We proceed in a very different way: our railways and steamers transfer us in a few weeks to distances which in old days would have cost centuries. It is only in a few savage tribes that progressive colonization is still witnessed.

Progressive colonization would be impossible nowadays to European emigrants; but if it were possible it would certainly not be preferred. And, in fact, what are the losses in our system of colonization compared with those of the past? The primitive migrations are not recorded by history, but by analogy we may easily imagine how millions of individuals were hurled to destruction in their desperate struggle with men and surroundings. Every step was a battle. The Kalmouks, in their exodus of 1771, were over 600,000 when they left the Volga, but, five months later, only 350,000 reached the frontiers of China. In the present day we transfer shiploads of emigrants to any part of the world with hardly a single loss, but we land amongst them a host of weaklings. In the old perilous migrations of people, only a small minority ever reached the promised land; but they were the survivors of the fittest. This was the secret of their success.

A question of the greatest importance in colonization is that of racial intermarriage. Crossing with native stock or with immigrants better adapted to the new environment is considered by many as the best and most rapid mode of securing acclimatization. Intermarriage is said to be the secret of Spanish and Portuguese success in Mexico and in the Philippines.

Race-crossing is certainly present in all colonial populations. Considering only the half-breeds which have resulted from the intercrossing of the white race with the coloured ones, we find that there are over 18,000,000. It is a natural process, which, by gradually blending varieties, tends to unity of character.

But intercrossing is by no means essential to acclimatization. Half-breeds resist no better than pure whites in unhealthy colonies. The Portuguese who intermarried in India with the native women have been almost entirely absorbed; on the other hand, the most successful examples of naturalization have occurred where there has been a complete absence of crossing, as among the Jews in the Bourbon islands and the Boers in South Africa.

The native problem is a very difficult one. Two distinct races, to whom intermarriage and social equality would be impossible, cannot subsist side by side. The struggle between the white man and the aborigines of America and Australia is an example. Our pioneers showed themselves cruel, treacherous, merciless. The natives were shot down like wild beasts or poisoned by strychnine. Small-pox was purposely disseminated amongst them, and in New England, so late as 1756, the government paid money for Indians' heads. It is a cruel page in the history of mankind, but such is the struggle for life.

In sketching the various facts which bear on the problem of colonization, I hope I have succeeded in proving how unimportant are meteorological agencies in themselves. I do not mean to say that heat and moisture have no direct influence on our well-being, because certainly they have. But we have two strong means of protection against meteorological agencies. One is that wonderful process of organic adaptation, which can change into hair the wool of European sheep imported to the West Indies or to the west coast of Africa; the other is advancing civilization, which has almost freed us from the bonds of nature.

The true obstacles to colonization are the multitudinous living mites which team in the tropics like every other form of life. Against these nature can only give us fair play; they are her creatures as much as ourselves. But we worship Science, and that goddess will surely lead us to victory.

The almost incredible reduction in mortality obtained in all tropical colonies through improved sanitation, shows that the diseases of the tropics are greatly under our own control. But what has been the sanitation of the past? A blind application of measures which had proved useful against other diseases in our own climates.

To act efficiently in the prevention of diseases, we must have a thorough knowledge of the parasites which induce them; we must know their areas of distribution, their extra-corporeal habitat, the conditions favourable to their development, the means by which they are conveyed to man. A great deal has already been achieved in tropical pathology by a host of noble workers, such as Pasteur, Koch, Laveran, Hansen, Manson, Kitasato, Bruce, Sanarelli, but a great deal more remains to be accomplished. There are numberless diseases in the tropics of which we know nothing, except that they kill. The young practitioner generally goes out to the colonies with only a limited knowledge of the diseases most common in Europe, unprovided with means of scientific research or totally unfit to pursue it. Whatever he sees there he groups round the few familiar types. What matters if there are striking differences? he will easily explain them by the special climatic influences of the locality. A favourite expression of Indian medical reports is that "malaria dominates the pathology of the region." In such reports, relapsing fever is malaria, blackwater fever is malaria, typhoid fever is malaria, and so are other diseases.

If attempts at colonization in the past have often been unsuccessful, if they have always cost immense sacrifices in lives and money, it is because they were made in complete ignorance of the conditions essential to success. I hope that this afternoon's discussion may finally extricate the question of tropical colonization from the old exploded theories, and place it on the sound basis of modern scientific knowledge. It would be ridiculous to continue further to dispute the possibility of tropical colonization, now that over ten million white men and their descendants are already settled within the tropics, laying the foundations of new and perhaps greater civilizations.

Before the reading of the paper, the Chairman, Sir JOHN KIRK, said: The President regrets very much being unable to attend, being still indisposed; he has asked me, therefore, if I will take his place on this occasion. The subject announced for discussion will be introduced to you by Dr. Sambon, who has had great opportunities of studying the question of acclimatization of white men in tropical Africa. I will ask him now to give us an account of his views on the subject.

After the reading of the paper, the following discussion took place:—

Dr. PATRICK MANSON said: I have prepared a few remarks on the subject of this discussion, but before reading them, I express my astonishment at the wonderful similarity between the observations I make here and those that Dr. Sambon has already given expression to—a fact, it seems to me, which goes a long way to prove the truth of his statements and deductions.

In former years, under the influence of early teaching, I shared in the pessimistic opinions then current about tropical colonization by the white races. In recent years, however, my views on this subject have undergone a complete revolution. This revolution began with the establishment of the germ theory of disease; it gathered force as, one after another, the great disease scourges of mankind, of beasts, and of plants were proved to be caused by living organisms; and it was complete when I had personally convinced myself that Laveran's immortal discovery of the protozoal germ of malaria was indeed a fact. I now firmly believe in the possibility of tropical colonization by the white races. Its practicability has already been proved for many countries. I believe the time will come when it will be proved for all countries; theoretically it is already proved, but how long we shall have to wait for the practical proof, I cannot pretend to say. Its postponement is entirely a matter depending, in the first place, on the growth of knowledge, and in the second, on the general assimilation and common-sense application of this knowledge. Knowledge in this department of science is advancing very rapidly, so rapidly that I think we cannot have many more years to wait.

To state fully the grounds of my beliefs in this matter would only be to recapitulate the facts and arguments Dr. Sambon has so ably advanced. The gist of the situation is simply this. Heat and moisture are not in themselves the direct cause of any important tropical disease. The direct causes of ninety-nine per cent. of these diseases are germs; that is to say, plants and animals—plants and animals with tropical requirements. So long as it was believed that the peculiar meteorological conditions were the direct cause of the unhealthiness of the tropics, so long did it seem impossible to secure health there, for we cannot materially influence the weather. But now that we know that the unhealthiness of the tropics depends on the plants and animals of the tropics—the pathological fauna and flora, the position becomes much more hopeful. For what known plant or animal is there that man, in virtue of his intellect, cannot slay or protect himself against, provided he knows what it is and where it is. To contend with them successfully, we must know these plants and animals, and we must understand their habits and their vulnerable points. To know our enemy is the first step to conquest. We do begin to know something about our tropical pathological enemies. When we know them and their habits fully, then victory is within our grasp; we need only to apply the knowledge to secure it.

Most diseases are caused by parasites. Unfortunately, most parasites, when they have got below the surface of the body, whether it be the epidermis covering the body or the epithelium lining the mucous tracts, are safe. We may, to some extent, by drugs and other means, hamper them a little when thus fairly lodged; in no instances, however, can we under such circumstances be sure of killing them outright. But these same parasites, from their very nature and in order that their respective species may keep in existence by spreading from one host to another, must at some time or another leave the human body. Thus it comes about that they have perforce to live for a longer or shorter space in outer nature. During this necessary extra-corporeal state they are exceedingly helpless and eminently vulnerable. Herein lies our opportunity. To kill them then is simply a matter of knowledge and the application of this knowledge—sanitary science and sanitation, in fact.

Perhaps this fundamental principle of sanitation is best brought home by an illustration. Let me make use of an illustration drawn from tropical pathology. You will pardon me if I select one with which opportunity and study have made me specially familiar.

In nearly all tropical countries, a large proportion of the inhabitants—in some places ten per cent., in other places up to seventy-five per cent.—harbour one or other of the four or five species of blood-worms now known to occur in man. Some of these blood-worms give rise to grave disease—that hideous disease, very appropriately named elephantiasis, for example. Now, in order to prevent this disease and allied affections, all that is necessary is to keep the cause, the blood-worms referred to, from entering the human body. How can this be done? Simply by acting on the knowledge we possess of the life-habits of those blood-worms during that extra-corporeal and vulnerable phase to which I have alluded, and which is common to all parasites. It so happens that we know, in the case of this particular blood-worm, what this extra-corporeal phase is and where it is passed. We know that every evening these worms are carried by the blood-stream to the surface of the body. We know that certain species of mosquito, when they imbibe the blood, swallow with it the floating worms it contains. We know that these ingested worms, leaving the stomach of the mosquito, enter the thoracic muscles of the insect and therein undergo a wonderful metamorphosis, a metamorphosis which in due course qualifies them for living as free animals in water. We know that when the mosquito dies, which she does soon after laying her eggs, she falls into the water on which these eggs are deposited; and we know that the blood-worms she contains escape from her dead body and swim about in water as free animals. And we believe, I might say we know, that when man inadvertently drinks this water he swallows the blood-worms, which then pass from his stomach to his tissues, and so start a new colony of blood-worms, and very possibly grave disease. Now, from this piece of knowledge, it is easy to prescribe a dozen simple ways of preventing blood-worm diseases—elephantiasis, for example. We have but to keep the mosquitos down—not a very difficult matter if we set about it the right way; or we have to prevent, by simple means, the mosquitos from preying on already infected individuals; or we have to keep the mosquitos from getting access to our drinking-water; or we have to kill, by boiling or filtration, the larval blood-worms which our drinking-water may contain. Knowledge of the facts of the life-history of these blood-worms, that they are conveyed to man by the mosquito through drinking-water, at once indicates simple and thoroughly effective preventive measures. No one now need suffer from elephantiasis.

I could quote other instances of tropical disease in regard to which knowledge of the life-history of the germ confers on man an absolute power of prevention, a power, moreover, easily given effect to. There is a weak and unprotected point in the life-history of every parasite, and on which, did we but know where it lies, man can place his finger and stay disease.

I wish I could indicate with precision this weak point for the malaria parasite, that germ which, *par excellence*, renders the tropics in many places so deadly, and which is, in fact, the main obstacle of the successful colonization of the tropics by white races. There are signs, however, that the day of deliverance from this worst curse of mankind is at hand. Fact after fact is coming to light about the malaria germ, and step by step we are approaching that complete knowledge of its life-history which alone will enable us to crush out this terrible parasite, or, at all events, to protect ourselves from its attacks. This consummation has been unnecessarily long in coming, thanks to indifference to our true interests and duties. Is it not a strange thing that, though thousands of men can be got to toil unceasingly, to undergo endless fatigue, privation, and danger, to expend brain and muscle and money, merely to unearth some handfuls of yellow dirt or some glittering pebble, yet for this grand work of attaining the knowledge by which we may cope with the malaria beast, so few labourers and such meagre means are forthcoming? I do not believe that in all the world at the present moment there are a dozen men actively engaged in strenuous endeavour to work out the malaria problem, notwithstanding its enormous importance, an importance compared to which the greatest war is as nothing. And yet the problem is not a hopeless one, for, given adequate means and opportunities, its solution is by no means an impossible matter. I think it was Carlyle who said, that if the time and care and effort devoted to the training and turning out of one ballet girl were but devoted to the Irish question, that troublesome political bugbear would be quickly settled. The same might be said of that much greater, much more important problem—the malaria problem.

The successful colonization of tropical lands is entirely a matter of knowledge, and of the application of knowledge. This the Royal Geographical Society, so long the pioneer in scientific tropical travel, cannot fail to appreciate. We may be assured of its sympathy and encouragement in any project having for its object the betterment of the health of the traveller and the colonist in tropical lands. This reflection encourages me to mention that at the present moment some of us are trying to establish, in connection with that neglected field for the investigation and study of tropical disease—the hospitals and dispensaries of the Seamen's Hospital Society—a school for the practical training of medical men proposing to practise their profession in our tropical colonies. Surely a laudable object, and one which, more than anything I know, would provide us, if carried into effect, with trained investigators capable of advancing our knowledge of tropical disease, and of spreading that knowledge. Yet such is the indifference of the public to this a public duty, that our scheme hangs fire, merely for the want of a few thousand pounds. It languishes in a country whose sons yearly die by thousands from tropical parasites; in a country whose unexampled prosperity is owing to, and depends in great measure on, tropical countries. And yet we are so rich that the Chancellor of the Exchequer does not know what to do with his surplus millions. Worthy objects of benevolence are so scarce, apparently, that the rich have to fall back on starving cats, homeless dogs, and broken-down horses. I wish some of these rich men, conscious of the responsibility of wealth, would recognize that the attainment of a scientific knowledge of the many unsolved tropical-disease problems is a far worthier object for their beneficence than any number of cats or dogs or horses. A few of their surplus thousands would go a long way towards solving the problems of the colonization of the tropics by the white races.

The CHAIRMAN: Perhaps Sir Harry Johnston, who has studied this question on the spot in the tropics, will be able to make some remarks upon the position of Europeans in respect to colonization such as he has observed it in these countries.

Sir HARRY JOHNSTON: My general conclusions, I imagine, are quite those of the reader of this very interesting paper; that one should distinguish as a general rule between the effects of climate and the effects of what I suppose is due to soil and other local conditions independent of, to a great extent, though perhaps created by, the climate. At the same time I think this theory, like other theories, must not be pushed too far. It has often been remarked to me by Europeans in Central Africa, and I have said it over and over again myself, "What a delicious climate, but what a cruelly unhealthy place!" There are many parts of Africa where the climate is disagreeable, where great heat and moisture are combined at the same time; but in much of the interior of Africa, as the Chairman of this meeting knows perhaps better than most people, the climate is delicious. In Dr. Livingstone's book on the Zambezi expedition he remarks, and quotes the remarks of several naval officers, that the climate "is like that of Italy." But I take it that there are germs in the soil—I have often thought perhaps it is because of the land having lain fallow so long, never having been chastened by tillage—there are germs in the soil and water which are peculiarly fatal to Europeans, and which to some extent are also harmful to the indigenous inhabitants of the country. Yet, as I say, the theory must not be pushed too far, because there are many parts of the tropics where the climate causes not only ill health in Europeans who go out for temporary purposes, but also a certain deterioration in the children born there. I have visited India for a few months only, but I confess I came away with the impression that the bulk of those Britons pointed out to me as having been born and brought up there did not strike me as reaching the same high physical and mental standard as those other of their fellow-countrymen who had been born in the United Kingdom. We have not been connected sufficiently long with India yet to be able to speak decidedly on the subject. The number of generations is very limited; but still, although I should certainly be averse to opposing the idea that eventually in tropical countries a European race might take root, I think it would be an inferior race. If we look at the history of the world, we find the great races do not seem to be produced in tropical countries. In most parts of

Australia I am prepared to admit that, owing to the greater dryness of the climate, the heat alone is possibly not an obstacle to successful European colonization without degeneration; but I confess I am unable to give up the idea, much as I should like to do so politically, that in most tropical countries the European settlement of the country would tend to the eventual production of a slightly, and possibly greatly, inferior race. However, it seems to me for practical purposes we need hardly discuss matters so very far ahead, because most tropical countries contain a very abundant native population, and there are obstacles from that reason alone, such as the great competition which would ensue, and our modern ideas of forbearance to our fellow-men of all colours, which make us refrain from pushing those people out of the way to provide room for European colonists. That need will only come when some supreme exigency forces Europeans to set right aside and replace it by might. What we do want is the knowledge of how a limited number of Europeans may *rule* the tropics, because so inferior are all indigenous tropical races that there scarcely remains a single tropical country which is independent politically, or whose independence is not more or less threatened. What we desire to find out is how, without unreasonable loss of life, our fellow-countrymen can govern tropical regions. In some parts of Africa the loss of life is not so alarming; but take British Central Africa—the loss of life there is so great that the gains scarcely balance it, but we have such hope for the future that we are afraid to give in. Therefore, if we could solve the problem of how to live in such a country in reasonable health, the gains, politically and commercially, would be so enormous that we might put aside for the moment the question of whether European races can wholly replace the existing people of the country.

To narrow the issues still further, there are only three diseases we have to combat in Central Africa—they are common malarial fever, and then, in an ascending scale, dysentery, and either yellow fever or black-water fever. I think the problem of how to maintain existence for a reasonable term of years has been practically solved in India. The average health of our fellow-countrymen in India is so good that we can set that question aside as settled. It is so, also, in Ceylon, and likewise in most parts of tropical Asia. But in Central Africa the loss of life is, and will remain for some time, very serious indeed from those three diseases—ordinary malaria, dysentery, and black-water fever. I quite agree with the general tenour of the lecturer's remarks, that these diseases do not spring from climatic effects, but from germs. If we could combat those germs, we should remove the terror that attends visiting those countries. But even in quinine we have found no prophylactic. Quinine cures individual attacks of malarial fever, but the constant taking of quinine does not in the least prevent a man incurring malarial fever, and he may end by suffering from too much quinine. On dysentery it has a less marked effect, and on black-water fever it has no effect at all. We know scarcely anything at present of how to extirpate or neutralize the germs of those three great diseases. As that alone is such a gigantic task, we should obtain better results by applying ourselves first to this practical end rather than to the much vaguer and more distant problem of whether European races will ever be able to colonize tropical countries.

Mr. J. A. Baines: I did not expect to be called upon to say anything, because the lecture has taken such a scientific form that I feel I can hardly add anything to the discussion. I have, however, spent about twenty years in tropical countries, and have studied the general question of the acclimatization of different races, mostly in India. I have also taken occasion to learn what I could of the mixed races in South America, particularly the Spanish. I cannot say I agree entirely with the deductions of the lecturer as to the success with which these experiments have been attended. Of course I regard the word "acclimatization" in the sense in which Sir Harry Johnston regards it, that a race must not only live, but be able to reproduce itself quite as efficiently as it does in its own country. If we colonize at all, we do not want to degenerate, but we want to have the same capacity that we enjoy in our own country. Looking at it in that way, the little attempts at acclimatization in India have absolutely failed. I quite agree with Sir Harry Johnston that the country-born British there are excellent people in their way, but both physically and in character they are decidedly below the young men we get imported fresh from England, who serve their generation and go back to their own country without any idea of settling or colonizing. I also agree with what has been said about children. Children, if kept in the tropics, even in the best of highland climates, degenerate after a certain time, and very often come home outgrown physically, and certainly not of the same mental capacity as their compeers at school here. I think the lecturer mentioned the Portuguese. The Portuguese of the west coast of India contain no blood of the Portuguese race at all. A large number of people in the British districts around Bombay have Portuguese names because the people who converted them happened to be Portuguese bearing those names; they won't call themselves Portuguese, but native Christians. The natives of Goa are no more Portuguese than any of the Hindus. On the East Coast of Africa I think there has been undeniable intermixing. The Portuguese habit there has been to intermarry with the native races to such an extent that there is little real Portuguese blood left, and what is called Portuguese is decidedly mixed. If we go back to Europe, I think any one who knows Portugal would say the upper class people are by no means of the same purity of blood as we find amongst the Spaniards or other Latin races. There is a decided mixture among them of Semitic blood, whilst, on the other hand, amongst the peasantry you can find marked traces of their Gothic ancestry. As to South America, I do not agree that the Spanish race in the tropics there has continued either in its efficiency or purity. The Spaniard of America is of a very different sort from the Spaniard of Spain. I must say we have heard a great deal of theory from the speaker behind me, but the question, as it appears to me, exists at present in the region of theory only. All the experiments that have been tried have not led us to believe that they will be successful in raising up a white race in the tropics that will keep up to the European standard of efficiency.

Dr. FELKIN: I should like to say one or two words, although several points to which I intended to refer have already been touched upon. I think that Dr. Sambon should place a limit as to the time when this acclimatization is to take place. If we are to infer from his paper that acclimatization is immediately possible, I do not agree with him; if he means in the distant future, say in four or five hundred years, there is no reason why we should not look forward to acclimatization by Europeans being possible anywhere at that date. In the present condition of our knowledge, I do not think we can contemplate with complacency any attempt to settle a large number of Britons in tropical regions. We can only expect great loss of life and suffering, and the survival of a very few. It is perfectly true, as the reader of the paper remarked, that the inhabitants of the tropics have, in time, passed towards the north, and it is theoretically possible for the inhabitants of the north eventually to regain possession of tropical lands. But I do not think any of us will ever live to see that day, and I cannot help regarding Dr. Sambon's opinions as rather dangerous, unless qualified by a time limit. If we grant that the cradle of mankind was in a tropical centre, from whence man overspread the world, we must not forget that the migration which took place occupied many centuries, and was, as we know, attended by enormous loss of life, only the fittest surviving. In my view of the matter, notwithstanding the advance of sanitation and personal hygiene, a considerable period must elapse before the reverse process could take place, and the inhabitants of temperate regions re-occupy and become acclimatized in the tropics.

I certainly think the paper ought to do a great deal of good in stimulating research with regard to tropical diseases, and also in influencing the public to acknowledge their duties with regard to the education of medical men proceeding to the tropics. Of course, malaria and other diseases, to which reference has been made, are not fully understood at present, and a thorough investigation of them is essential; and as to the need of a special education before going out to tropical regions, there is no doubt of its importance. I do not mean that this training or teaching can do more than help towards making acclimatization possible—far from it; theoretical teaching and practice are frequently hard to reconcile. In the rough and tumble of life, a man cannot take all the precautions which he knows are advisable, and accidents are therefore inevitable. Still, fore-warned is fore-armed all the world over, and very much is gained by being prepared beforehand. I was only reading this morning that many years ago Max Müller tried to make Macaulay see that Great Britain, which had the largest oriental empire in the world, ought to have a school for teaching oriental languages, just as France, Italy, Germany, Austria, and Russia, had and have. Now we see that these governments are reaping their reward. It is just the same with the knowledge of climatology and tropical diseases. On the continent great attention is given to the subject, and they will have their reward; in this country we let things slide, and we too shall meet the consequences.

Theoretically, acclimatization may be possible, but I do not think that at present it comes within the region of practical politics.

Mr. Alfred Sharpe: Having lived for the last ten years in Central Africa, I cannot, of course, fail to have formed opinions on the question that has been discussed to-day, and it seems to me that we can theorize as much as we like on this subject, but the fact remains that Europeans continue to die there. The death-rate is very high; and, do what we may, we cannot, as yet, prevent it. There is one point which struck me in the interesting paper which Dr. Sambon read, and that is that he spoke of "heat." I do not know that "heat" has anything to do with unhealthiness in tropical countries at all. The whole question is malaria, so far as Africa is concerned; there is greater heat in Australia than in Central Africa. As Sir Harry Johnston has said, as far as Central Africa is concerned, there are three serious complaints, and if the doctors can find some means either to enable us to prevent those fevers coming or to minimize their effect, then they will have achieved much. It is, in my opinion, impossible for colonists (in the sense of permanent settlers) to do much in Central Africa until we find some means of preventing or curing malaria.

The Chairman: I think you will wish me to convey to Dr. Sambon your thanks for the able paper he has read, which has given rise to so interesting a discussion. We have heard two views expressed; the first is that which Dr. Sambon advocates, that we have the means of getting rid—if we would only study the subject—of all the difficulties that stand in the way of the colonization by Europeans of tropical countries; the other, that we are a long way off from that result as yet. My experience in Africa has shown me that, apart from the question of health, the white man has to compete with the black man in tropical countries on unequal terms. The black man is the best, because the cheapest, labourer in tropical countries, and I do not see that the white man can ever colonize in face of the black man so as to supplant the latter for unskilled work. The black man needs some one to guide him, but with such guidance he will always work better, and do more work in the tropics than the white man could do there; so far, therefore, as my experience goes, we can, for the present, only look, as Sir Harry Johnston says, to organizing a governing European class that will rule and guide the black man. Under such rule, whenever it has been applied, we see the black man increasing so rapidly, that the white man would have no chance at all. We know that in America the Spanish race has degenerated, and in India the Goanese have now little or no Portuguese blood in them whatever. I will, if you will allow me, now thank Dr. Sambon for his interesting paper.

Mr. J. W. Wells: There is one thing I should like to call attention to which seems not to have been noticed in the discussion, and that is the fact that many delicately constituted children become adults in a tropical climate, who in this country would probably never have reached that stage at all. I maintain that the English race, in its days of childhood, has to endure such a series of rapidly changing temperatures and climatic variations, that a Britisher is tempered to live anywhere. An American replied, when he was asked about our climate, "You have not a climate, but you have quite a quantity of samples, and I do not wonder, that provided you can live through these samples, why you can just live anywhere and populate the world." My conviction is that many of the feebly constituted children born, and attaining manhood, in tropical climates, if born and reared in this country, would have ceased to exist at an early age. The consequence is that, in the majority of tropical regions, the existence of feebly constituted inhabitants is rather due to the amenities of the climate rather than as one of its detrimental effects. The British race is an example of the survival of the fittest.

The following letter has been received from Colonel J. C. Gore, Colonial Secretary of Sierra Leone:—

"Dear Sir,—I regret to say that the notice of the meeting of the 27th instant only reached me on the afternoon of that day. After twenty-five years' experience of the climate of West Africa, I am of opinion that Europeans do not become acclimatized. The only advantage old residents have over new-comers is that they know better the dangers to avoid, and the best means to take in that direction. I consider that an old resident in West Africa is just as likely to be carried off from a bad attack of fever as is one who has just arrived; in fact, the odds are rather in favour of the new-comer, as he is likely to be in better condition. It is a well-known fact that a person who has once had an attack of so-called black-water fever is more liable to have another attack when subjected to the same influences, and that each attack increases the risk he runs when returning to West Africa. I am strongly of opinion that, when once a person has had this disease, he should not be allowed to return to the West Coast. Acclimatization may be possible in other tropical countries, but West Africa is exceptional. I am very much interested in the question naturally, as I am still serving on the West Coast of Africa. I attribute my escape from the effects of the climate *to great good fortune*, and, of course, being very careful in my living."

SURVEY OF INDIA REPORT.

The report of the Survey of India under review ends with the summer season of 1897. It is consequently rather more than a year old. Why it should be so late in publication is nowhere explained in the body of the report. It was a season of steady hard work and satisfactory progress in all branches of the department, with none of the lighter incidents of campaigns or political missions to break its level monotony.

There is now but one trigonometrical party in the field, and the field of its operations is not an easy one. It is slowly pushing its way westward from the Indus through the already surveyed districts of Southern Baluchistan, in order to strengthen the original triangulation of that part of the frontier, and to give the basis for further extensions. This is the series which may one day unite the geodetic triangulations of Russia and India. The disasters which attended it last winter, when it was temporarily withdrawn from the field, form, of course, no part of the present report. Six parties took the field for topographical duty, and between them completed 14,460 square miles of topographical mapping. A large part of this area is in Upper Burmah, in the wild and jungly Shan states west of the Salween, and includes much of the country through which the now half-completed railway from Mandalay to the Kun Long ferry on the Salween is carried. The new topographical survey of Sind is progressing well, as well as that of the Himalayan states. It is curious that the districts immediately surrounding Simla should have waited so long for representation on the 2-inch scale. The Baluchistan topographical survey is practically finished, but the party will be well occupied in future with Sind topography and with the extension of north-west frontier surveys and reconnaissance generally, retaining its headquarters at Quetta. Several of the native members of this party have been temporarily transferred for service in Africa, and it is gratifying to learn from other sources than this report that their work has been greatly appreciated by the administrative authorities. The total outturn of forest surveys on various scales (from 2 inches to 16 inches) is 4825 square miles, of which 1563 were surveyed by the Forest Survey branch of the department. It is, we believe, probable that all the Imperial Forest Surveys will be brought under the administration of the surveyor-general ere long. Cadastral surveys amount to 7190 square miles of outturn on scales varying from 8 inches to 24 inches per mile, and they include by far the largest share of the survey programme in Upper Burmah and Bengal. In the latter province famine seriously interfered with progress. In addition to the above (which may be regarded as normal departmental business) special operations were conducted for latitude determination in Madras, fixing the value of the Madras observatory at 13° 4′ 8″·02 N. lat. Tidal observations and spirit-leveling are also included under the special head. The outturn for geographical survey and reconnaissance amounts to 78,718 square miles, of which 11,718 are credited to Burmah parties in the report, the balance presumably being on the north-west frontier. With all this mass of fresh material, the headquarters office at Calcutta, as well as the drawing-office at Simla, which especially deals with frontier mapping, has been kept well occupied in map-reproduction. Thus it must have been with regret mixed with considerable inconvenience that the surveyor-general parted with two such capable assistants as Colonel Waterhouse (whose reputation spreads far beyond India) and Colonel Rogers, from his office. But the laws of compulsory retirement at a fixed age know no relaxation except in favour of departmental heads. On the whole the Survey Department is to be congratulated on a successful year's work.

THE MONTHLY RECORD.

EUROPE.

Physical Geography of the Maritime Alps.—Dr. Fritz Mader makes an important contribution to physiographical literature in the booklet recently published by Gustav Fock, in Leipzig, on 'Die höchsten Teile der Seealpen und der

Ligurischen Alpen in physiographischen Beziehung.' An exhaustive account of the geography of the Maritime Alps is given under the headings of topography and relief, structural geology, climatic conditions and firn-limits, hydrography and drainage, and erosion and denudation. Notes on the flora and fauna are added in an appendix; also a bibliography of the various parts of the subject. The work is illustrated by a number of excellent photographs taken by the author; but there is no map.

ASIA.

Shantung and Kiauchau.*—Under this title Baron v. Richthofen has issued a volume embodying, in a popular form, much of the matter that has already appeared in vols. i. and ii. (1877 and 1882) of his great work on China, the third volume of which is still so eagerly looked for. With this is incorporated such information as could be gleaned from the scanty additional materials relating to the province available before the date of printing of the present work (May, 1898). From the preface it is interesting to note that the acquisition of the harbour of Kiauchau by the Germans about this time last year was the realization of a hope that Baron v. Richthofen had ventured to express about the time of his own journeys in Shantung, nearly thirty years ago; and there cannot be the slightest doubt that the Baron's work in this province and other parts of Northern China has been one of the chief causes of that hope being accomplished. Kiauchau is described on the title-page as the gate of entry to Shantung, but Baron v. Richthofen also gives, on pp. 292–296, a short account of the vast mineral resources of Shansi (see the November number of this *Journal*) as properly belonging to its hinderland. (It is time we had an English translation for the now otherwise indispensable *Hinterland*.) He expresses his regret that the development of these mineral treasures has not fallen also to Germany, but the fact that the right to work them has been conceded to an Anglo-Italian syndicate is at least no reason why their working should not contribute to the prosperity of a German port. If this port is geographically the most convenient, which seems unquestionably to be the case, it must be in the interest of the Anglo-Italian syndicate, as it would certainly be best (from a purely economic point of view) for the world at large, that it should do so. In the concluding pages Baron v. Richthofen makes a few observations on the economic development of Shantung, and adds some general considerations on the approach of the new economic era in China. On one point in these general considerations it may be worth while to make a comment. Baron v. Richthofen insists, as he has always done, on the fact of China being by far the greatest storehouse in the world of "cheap, intelligent labour" (p. 306). That such is the case there is no reason to doubt; but it may fairly be asked—How long will Chinese labour remain cheap under new conditions? We know that one of the first results of the economic development of Japan has been a great rise in the cost of living and the wages of labour. In China a like rise may even be more marked. The mining and manufacturing districts of Japan are close to or on the seaboard, reducing to a minimum the cost of maintaining an industrial population by imported supplies. In China the region (Shansi) that promises most in the way of industrial development is far from the sea, and difficult of approach. If a great industrial population is to be maintained in that "poor mountain-land," as von Richthofen calls it (p. 293), it can only be by supplies brought probably from a considerable distance, which must greatly enhance the cost of living and of labour. It is not conceivable that it can so raise prices as to prevent the working of such vast resources, but the question of the extent of this rise, which seems inevitable, introduces an element of great uncertainty into any forecast of the precise nature of the consequences likely to flow from their working, great though these consequences must undoubtedly be. In a pocket accompanying the volume are three maps, two of Shantung, one geological and one orographical, on the scale of 1 : 1,000,000; and one of North-eastern China on the scale of 1 : 3,000,000, showing existing and projected railways.

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* 'Schantung und Kiautschou,' by Ferdinand Freiherr v. Richthofen. Berlin: Diet. Reimer, 1898.

Sir George Robertson on Chitral.—Sir George Robertson has just published a description of the siege of Chitral fort,* in which he was shut up for six weeks in 1895. The book is remarkable for the grace and power of its literary style, and for the insight it affords into the character of the British officers, political and military, engaged on frontier work. But perhaps its most remarkable peculiarity is the light it throws on the life of the warlike mountaineers who inhabit the wild and almost inaccessible valleys of the mountain border of India. It is interesting to see how every phase of tribal, one might almost say national, existence amongst these people has been determined or modified by their physical environment. The sites of their villages are necessarily on the small alluvial plains by the river-sides, which afford a little cultivable soil; their roads must run along the valleys, crossing the turbulent streams by wooden bridges, and sometimes threading a *mauvais pas* on galleries attached to the face of the cliff. So, too, their principles of warfare; their strategy, which is of no mean order, always aims at isolating an attacking force by destroying roads or bridges in front or rear; and their skill in fortification and in siege may be equally traced to the training of their environment. But Sir George Robertson and his fellow-officers showed how, by taking advantage of the reliance of these people on their historic methods, and by their own superior moral force, a small number of native Indian troops, under a handful of British officers, could hold their own against a vastly greater number of no less brave and determined tribesmen.

Re-naming of the East Cape.—We learn from a note in *Petermanns Mitteilungen* (No. 10, 1898) that an Imperial ukase, issued in June last, has laid it down that, in future, the most easternmost point of Asia is to be named Cape Deshnef, after the active explorer of Eastern Siberia in the seventeenth century. The discovery of Bering strait was, in fact, due to his voyage in 1648, in ignorance of which the separation of Asia from America was re-determined by Bering in 1727, almost eighty years later.

AFRICA.

Major Marchand's Expedition.—The accompanying sketch-map is intended to show the route followed by Major Marchand between the Ubangi and the Bahr-el-Ghazal, with the posts established by him and M. Liotard, as well as those with which the Bahr-el-Ghazal province was dotted over during the period of Egyptian rule. The principal routes of previous travellers are also shown; but, owing to the great number of these in the better-known parts, it is impossible to give them all on the small scale of our map. Thus the routes of the earlier explorers of the region—Petherick, Von Heuglin, the Poncets, Piaggia, Miani, etc.—are not inserted, but preference is given to those which extended into the more outlying districts, still imperfectly known, especially those of Schweinfurth and Junker. Much of the information collected by Gessi and Lupton, during their campaigns against the slave-raiders, has unfortunately been lost, owing to their premature deaths. The

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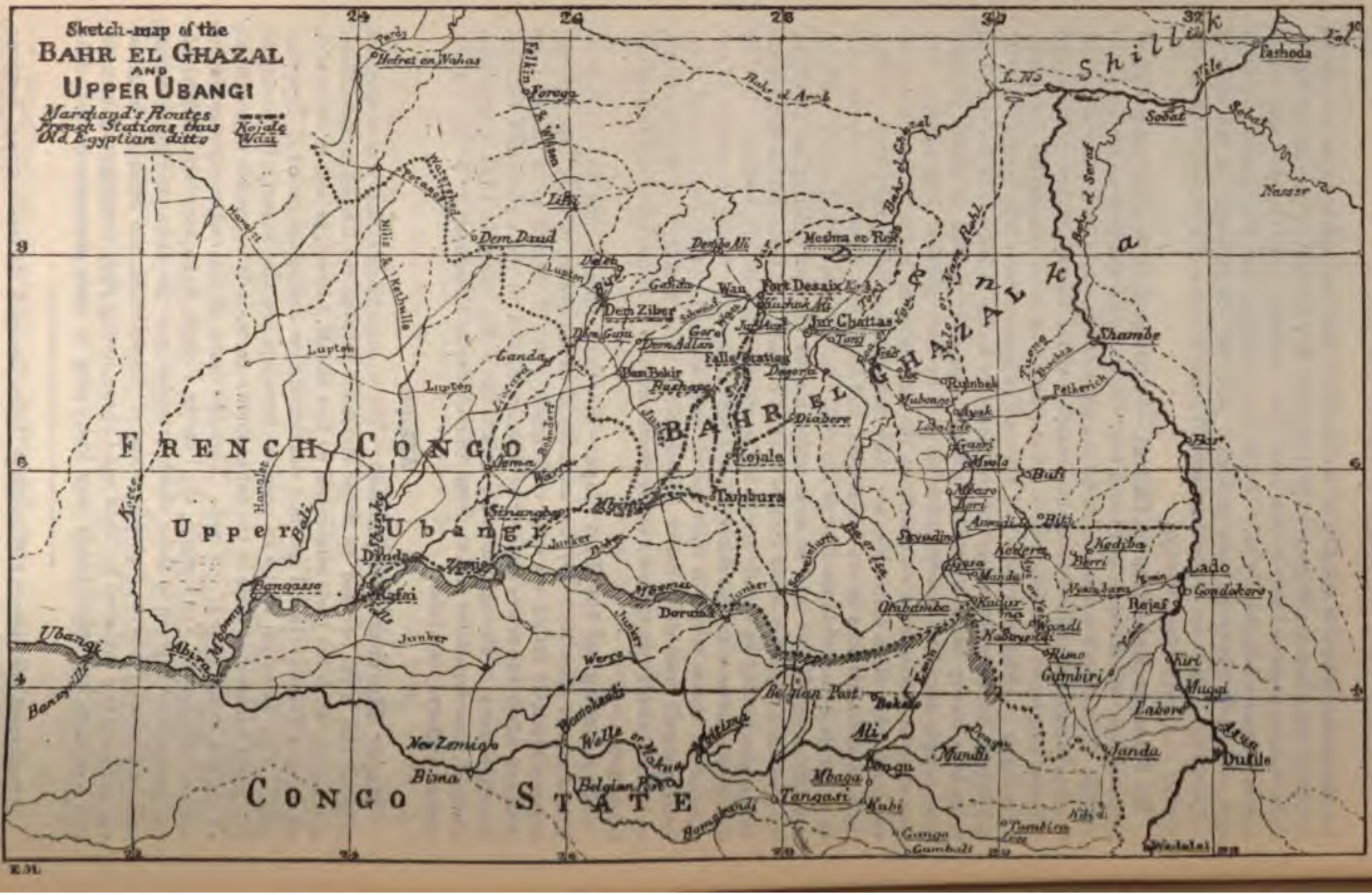
* 'Chitral, the Story of a Minor Siege,' by Sir George S. Robertson, K.C.S.I. London: Methuen & Co., 1898.



Sketch-map of the
BAHR EL GHAZAL
AND
UPPER UBANGI

region of the Mbomu and Welle has been traversed in all directions by Belgian officers, whose routes it has been impossible to show; but those followed by Hanolet, Nilis, and De la Kéthulle, in their important journeys towards the borders of Wadai and Darfur, before the evacuation of the Northern Ubangi districts in favour of France, are inserted. The routes of Marchand's expedition have been taken from a map given in the October number of the *Bulletin de l'Afrique Française*, which shows them only as far as Fort Desaix. Beyond this point the journey was made by river; but as the lower course of the Swe or Jur had not previously been laid down on our maps, the exact route cannot be known until the publication of the full report of the expedition. Some uncertainty prevails as to the French posts established within the Nile basin. Such are said to exist at Meshra-er-Rek, Jur Ghattas, and, according to some accounts, at Rumbek and Ayak. Major Marchand is even said to have advanced to within 50 miles of Lado, on hearing rumours regarding a European force in those parts. Whether, however, permanent posts were left towards the south-east, is very doubtful. The positions of the old Egyptian posts, of which all the most important are shown on our map, are taken from a useful map compiled by Mr. Ravenstein, to illustrate the letters of Emin Pasha. It will be noticed that the valley of the Swe was, under Egyptian rule, the least-known portion of the Bahr-el-Ghazal region, and that some increase of geographical knowledge will therefore result from the French expedition. In addition to the maps referred to in our last number (p. 524), one lately issued by the Intelligence Division of the War Office, showing the Nile basin from Berber to the Victoria Nyanza, will be found useful. The following may also be added to the list of authorities:—

Poncet, Jules, 'Le Fleuve Blanc' (1863).
Heuglin, Th. von, 'Die Tinnésche Expedition im Westlichen Nilquellgebiet 1863–64' (Supplementary Number 15, *Petermanns Mitteilungen*).
——— 'Reise in das Gebiet des Weissen Nil und seiner Westlichen Zuflüsse in den Jahren 1862–64' (1869).
Petherick, Mr. and Mrs., 'Travels in Central Africa' (1869).
Miani, 'Il viaggio di G. Miani al Monbutto' (1875).
Marno, E., 'Die Verlegungen im Bahr-el-Ghasal und deren Beseitigung' (*Petermanns Mitteilungen*, 1882).
Felkin, R. W., 'Aufzeichnungen über die Route von Lado nach Dara' (*Petermanns Mitteilungen*, 1881).
——— *and C. T. Wilson*, 'Uganda and the Egyptian Sudan' (1882).
Buchta, H., 'Der Sudan unter ägyptischer Herrschaft' (1888).
Casati, Major G., 'Ten Years in Equatoria' (1891).

M. Foureau's New Expedition.—It is announced, in the *Bulletin* of the Italian Geographical Society, that M. Foureau is about to renew his attempt to penetrate the country of the Tuareg, and open a route across the Sahara to the Sudan. He will now be accompanied by a force of 180 tirailleurs from Algeria, under the command of Colonel Lancy and other officers, so that it is hoped that the Tuareg, whose opposition has proved fatal to his hopes on previous occasions, will be overawed. The route chosen is that *viâ* Wargla, Fort MacMahon, and Fort Miribel.

The French in the Shari Basin.—At the opening meeting of the new session of the Paris Geographical Society, extracts of letters from M. de Behagle, leader of the commercial expedition into the Lake Chad region, were read, giving details of his progress down to the end of August. From Bangi to Wadda on the Ubangi, the expedition had followed the land route along the river-bank, 200 to 400 feet above the water. The ground was composed of long and regular undulations running north and south. M. de Behagle states that his surveys show that the courses of the Kemo and Tomi (northern tributaries of the Ubangi) have been incorrectly shown on our maps. The former makes such a bend towards the east that it approaches within an hour's march of the Ubangi, 12 miles from its mouth. The expedition seems to have reached the Kuango, an almost unexplored tributary of the Ubangi, and to be therefore following a route considerably east of Gentil's and Maistre's. The Sultan of Dar Runga, in the south of Wadai, is said to have sent a caravan to the Ubangi—a fact quoted as proving the complete success of Gentil's mission. The latest accounts, however, report that the Sultan of Bagirmi has been driven out of his capital by Rabah, and that the towns whose inhabitants favoured the French have been destroyed.

Explorations on the Eastern Frontier of Liberia.—The September number of the *Bulletin de l'Afrique Française* contains a short account of a journey lately made by M. Hostains, an official of the French Ivory Coast, in the upper basin of the Cavalli, the stream which separates that territory from Liberia. M. Hostains proceeded by canoe to the village of Guipola, on the right bank of the Cavalli, advancing then by land in a northerly direction, through the forests on the right or Liberian bank of the river. The village of Guipola belongs to the Diutu tribe, which inhabits the right bank of the Cavalli for a considerable distance. In their customs the Diutu seem rather to resemble the peoples of the southern Sudan than those of the Guinea Coast. Like all the tribes to the north, they are entirely independent of the Liberian authorities, and even the Liberian Methodist missionaries have not established themselves in their country. They have not yet acquired the taste for alcohol. In the thick forests of the Diutu country the copal tree is common, though very rare on the lower Cavalli. M. Hostains reached the Guetepo village of Matua, in about 6° N., being everywhere well received, but was then obliged to turn on account of disturbances on the lower Cavalli. He was, however, able to collect some information respecting the country to the north, in which direction the forest becomes thinner and abounds in elephants. The Panion tribe is subject to a chief named Dia, who dwells on the left bank of the Cavalli. Two days north-east of his village the river Zo is reached; it is more important than the Cavalli, and abounds in hippopotami, though these are wanting in the other rivers of the country; beyond it are plains, in great measure treeless. On the river Zo an excessively primitive tribe called Zaé is said to dwell. They were even reported to possess rudimentary tails! It is thought that the Cavalli might afford a good means of penetration into the interior, if once the opposition of the Tepos who dwell on the lower river could be overcome.

Dr. Hans Meyer's Fourth Journey in East Africa.—A letter from Dr. Hans Meyer, dated Moshi, September 16, 1898, giving details respecting his latest expedition to Mount Kilimanjaro, appears in *Globus* for October 29 (vol. 74, No. 17). The programme sketched by Dr. Meyer before starting seems to have been successfully carried out. Reaching Moshi on August 3 by way of Usambara and the Pare range, the traveller ascended, through Marangu, to the east side of Mawenzi above the forest zone (about 12,800 feet), descending again to Useri and Laikokitok, on the north side of the mountain. The features of the hitherto unexplored upper region of Mawenzi to the east were thus examined, and the great north-eastern rift was seen to be not merely an eroded gully, but to be rather due to an important dislocation and sinking of the ground. An ascent was next made through the trackless northern forest, and a bivouac formed, at a height of 14,700 feet, at the north-eastern foot of Kibu, Dr. Meyer's only companion being the artist Herr Platz. The slopes of Kibu, composed here of glacial *débris*, rise extremely steeply.

On August 23, after a night in which the thermometer fell to 17½° Fahr., an ascent was made to the Kibu crater through the Hans Meyer gap. The ice conditions were found to have altered greatly since 1889, there being much less ice on the cone of eruption and elsewhere, while some of the outer glaciers showed signs of advance. Continuing his way round the northern and north-western side of the mountain above the forest zone, Dr. Meyer entered a very dry region, the forest being here much lower than on other sides. Radial lines of eruption stretch downwards between the north-west and west, the most important line, which seems to match that on the south-east of Mawenzi, being marked by a rugged group of cones, due to comparatively recent outbursts, whence vast lava-streams have covered the western side of the mountain. An ascent to the ice on this side led to the discovery of three important new glaciers, reaching down to 16,000 feet, the moraines at their feet giving evidence of recent fluctuations. Crossing the Shira ridge, which, contrary to expectation, proved to be of independent origin, and is certainly one of the oldest portions of Kilimanjaro, Dr. Meyer reached the extreme western districts of Chaga, examining *en route* the great western rift of Kibo (due originally to dislocation), which bends sharply to the south, and contains two glaciers, one of them reaching to a lower level (13,800 feet) than any other on Kilimanjaro. Further examination was made of the ice on the south side of Kibu, which shows a more imposing array of glaciers than any other. As a result of the journey, the map of Kilimanjaro will require much alteration, while the collections, photographs, and sketches will add much to our accurate knowledge of the mountain.

Garenganze to Blantyre, South of Lake Bangweolo.—An interesting journey has lately been made by Mr. D. Campbell, of the Garenganze Mission, with a view to the discovery of a short and inexpensive route to the coast *viâ* the Luapula and the south of lake Bangweolo. Mr. Campbell's diary of the journey is printed in *Echoes of Service* (August, 1898, part 2; and September, parts 1 and 2). Mr. Campbell left the Lufira valley in February last, proceeding south-east between the Kundelungu plateau and the Koni range, and crossing the Luapula near Chinama's village, visited by Mr. Weatherley. At its south end the Kundelungu stretches away in undulating woodland, known as the Bukanda country, famous for elephants and other game. From Chinama's the route lay first through hilly and sandy country, with many streams flowing west to the Luapula, and later through flat plains mostly flooded, the Luapula being again struck at its extreme southern bend. Mr. Campbell met with the dreaded chief, Mere-mere, but maintained friendly relations with him. His supremacy in the Ushi country is due to the possession of two oracles—blocks of metallic stone, said to have fallen from heaven. Many Va-Lamba refugees were seen among the Va-Ushi, having fled thither to escape the ravages of the Arab Chikwala in the west, and of the Mu-Vemba marauder Chikwanda in the east. The Luapula was skirted eastwards in its many windings through flooded plains, until near its exit from Bangweolo, when it was crossed at Sokontwe's ferry. This was only about twelve hours' march from the spot where Livingstone died, but inundations everywhere prevented a visit to it. The fear inspired by Chikwanda compelled Mr. Campbell to turn southwards towards the Irumi mountains through the pastoral Ilala country, apparently by a route to the east of Thomson's; much flooded land was again met with. Mr. Smitheman of the "Rhodesian concession" was found in camp at the Irumi mountains, prospecting for gold with five white companions. Mountains rose on either hand, whilst east and west was an immense tract of flat woodland. Proceeding eastwards through a promising and well-watered country, Mr. Campbell rounded the spur of the Changa range, and crossed the Lukosashe, a broad stream with a strong current, which forms the boundary between the Ila and Senga countries. It is not, as was supposed by Thomson, identical with th Lusiwazi, which rises in Moir's lake, but was crossed some days before the latte stream was reached. The Lusiwazi flows to the Loangwa east of the Muching mountains, which, with their fertile, well-irrigated land, seemed to Mr. Campbe suited for European settlement. The Loangwa was crossed at Lunda's ferry, bein there about 250 yards wide and deep in midstream, and the further march t Mpeseni's led across the Nyemba hills, and afterwards over an open country lai waste by the Angoni war.

Belgian Scientific Exploration in the Congo State.—We learn from th *Mouvement Géographique* (No. 35) that plans have been made for a thoroug scientific exploration of the territories of the Congo State, and that severa travellers either have already set out or are at the point of doing so, in order t carry out this object. In addition to the expedition under Lieut. Lemaire, whic started last spring for Katanga by the East Coast route, two botanists have proceede by the West, while Captain Weyns has been charged with a mission which wil occupy a year, and M. Delhez has been commissioned to investigate the fluvia fauna of the Congo, and to carry out soundings and determinations of water-temperatures. We regret to record the death of M. J. de Windt, the geologis attached to Lieut. Lemaire's expedition, who was drowned in Lake Tanganyik early in August through the capsizing of a canoe. He had been a pupil of th Abbé Renard, and had also studied under Penck and Richthofen, so that much ha been hoped from his scientific work in the Congo basin.

Expedition to Sokotra.—A scientific party has lately left England fo Sokotra, with a view to the thorough examination of the zoology of the island, o which little is yet known, but which is of special interest from the fact that it affinities seem rather Indian than African. The party consists of Dr. H. O. Forbes director of the Liverpool Museum, Mr. W. R. Ogilvie Grant, of the Zoologica Department of the British Museum, and Mr. Cutmore, taxidermist. Our Society has joined with the Royal Society and British Association in contributing to the funds of the expedition, and the Indian Marine Guardship *Elphinstone* has been placed at the disposal of the explorers for their conveyance from Aden to Sokotra. Our present knowledge of the fauna and flora of the island is due chiefly to the visits of Prof. Balfour (1880) and Drs. Riebeck and Schweinfurth (1881), the principal attention having been in each case devoted to the botany, though the German travellers were accompanied by two zoologists, who, amongst other collections, brought back a number of skulls of the aborigines. A good account of the surface features, inhabitants, etc., of the island, with illustrations of its strange flora and other objects of interest, was given by Dr. Schweinfurth, in *Westermanns Monatshefte* for 1891 (vols. 69, 70); Prof. Balfour's full report on the Botany of Sokotra, published as vol. 31 of the *Transactions of the Royal Society of Edinburgh* (1888), contains an introduction on the general features of the island, and a map on the scale of 1 : 250,000.

AMERICA.

The Sierra Madre of Mexico.—At the meeting of the British Association at Bristol a paper entitled "Across the Sierra Madre from Mazatlan to Durango" was read by Mr. O. H. Howarth. He said that the journey was undertaken in April, 1898, over a trail which, so far as he was aware, has not previously been described by any European. It crosses the main range of Western Mexico on a line about 120 miles south of that followed by him in 1892. The recent erection of a direct telegraph line connecting the port of Mazatlan with the city of Durango led to the exploration of this new trail, it having been otherwise impracticable for any purpose except the casual mule traffic of the natives. The line runs in a north-easterly direction from the Pacific coast between the 23rd and 24th parallels N. lat., traversing an exceedingly wild and rugged district of the main range for a distance of 130 miles in a direct line, but nearer 200 miles following the precipitous contour of the mountains. There is probably no route through the great western range of North America exhibiting such vast alternations of elevation and depression within so comparatively limited an area. From Mazatlan the route followed was by a waggon road to the village of Presidio or Villa Union (altitude 120 feet), and thence to Concordia (altitude 380 feet), Piedra Blanca (610 feet), and the little mining town of Copala (1750 feet), which was reached on the evening of Easter Sunday. Up to this point the ascent is generally an even gradient amongst the foothills for the first 30 miles or thereabouts; but for some 70 to 80 miles further the range is constantly broken by enormous chasms which the trail traverses by repeated zigzag ascents and descents, frequently of 1500 to 2000 feet within a horizontal distance of 2 or 3 miles. Between the ranche of Ocotes and the cañon of the Rio Valuarte a descent of 1750 feet was made in a couple of hours; and on the afternoon of the same day the party camped at a point 4600 feet above this, on the first "cumbre," or dividing ridge. Early the next morning the pass of Los Monos was entered at an elevation of 6850 feet; and after descending again 2000 feet to the Llanito (little plain) of Chavarria, another ridge of the cumbre was crossed the same day at 9600 feet altitude. Throughout this region, remarkable for the grandeur of its scenery, the main ridge of the western anticline averaging 10,000 to 11,000 feet, seems to be split up into three or four parallel ranges with the above-mentioned deep gorges separating them. Beyond these commences a gradual descent from one to another of the curious mountain plateaus, or "llanos," including those of Las Juntas, Florida, Rusia, Mesa de Madroño, Coyotes, and Llano Grande, at altitudes from 9100 down to 8400 feet. These are usually open levels free from forest growth, and are utilized as grazing-ground for cattle. Occasionally, on the higher of them, where a water-parting occurs, may be seen a continuous stream course intersecting a plain not over a mile or so in length, at the ends of which the water is flowing in opposite directions. Beyond the Llano Grande extends a vast "mesa," or tableland, covered with scattered pine and other trees for a distance of some 30 to 40 miles at an altitude of 8000 feet. As this approaches the last hill range overlooking the great plain of Durango the ground becomes open and clear of timber, forming to all appearance an uninterrupted sweep towards the brow of the range. Yet within a mile of this last descent the traveller finds himself suddenly on the brink of the tremendous gorge of the Rio Chico—a winding rift across the level which has to be descended to a depth of nearly 2000 feet. Its geological structure is of great interest, exposing about halfway down a massive stream of pale grey vitreous lava, which has been covered to a depth of several hundred feet by other formations and sedimentary detritus. On reascending the opposite face and proceeding to the edge of the range, the plain of Durango comes in view, with the city a few miles from the foot of the last descent. This was reached on the evening of the seventh day from Mazatlan. The observations as to physical structure, temperatures, vegetation, and especially the human and animal occupants of these remote mountain fastnesses were of more than ordinary interest, presenting several features distinct from those noticed in other parts of the Western Sierras.

Dr. Steffen's Latest Journey in the Southern Andes.—We have received from Dr. Steffen, the well-known explorer of the Patagonian Andes, a copy of his report (in Spanish) on the exploration of the Rio Cisnes in 1897–98 (*ante*, p. 317), accompanied by a map of his route. The main objects of the journey were the determination of the watershed between the Lake La Plata of the Argentine maps, and the Pacific; and the discovery of the ultimate course of the Rio Félix Frias, also shown on Argentine maps in the latitude of the Poyehuapi estuary. Having discovered a large river, comparable to the Aisen, near the south end of that estuary, which appeared to lead in the required direction, Dr. Steffen sent back the steamer which had brought his party from Puerto Montt, and proceeded up the river—evidently the Rio Cisnes of Simpson—with two boats and two canvas skiffs. A fall caused by huge rocks in the bed of the stream soon necessitated the abandonment of the former, while a way had to be cut overland through the dense vegetation, not a trace of human inhabitants being seen. The valley in this part much resembled in character those of the Aisen and Palena. Further on, the Cisnes was hemmed in between perpendicular cliffs, and the difficulties of the march were increased by torrential rains. In order to gain a general view of the country, an ascent was made (February 25–27) to a height of 4500 feet on the north side of the valley, which was seen to continue eastwards towards the open Patagonian plateau. Towards the south a lake was descried, occupying a depression in the midst of a labyrinth of snowy ranges. This lake was found by exploration to send a short effluent to the Cisnes, and to be fed by a stream from the south-east. The longitudinal depression shown by Ezcurra in this locality as occupied by the "lagos Elizade," was found to have no existence; it was also proved that the extent attributed by Argentine explorers to the La Plata lake was exaggerated, and that the Cisnes drained the whole Andine region between the Palena and Aisen. As it seemed impossible to proceed further towards the south-east, it was decided to continue the ascent of the Cisnes valley, a portion of the party being sent back to the coast. An ascent to a height of 4600 feet on the south side of the valley disclosed the fact that the divide in the direction of the La Plata lake is formed by high snowy ridges. After renewed difficulties from the weather and the state of the ground, the valley at last opened out, showing a series of terraces marking ancient levels of the river. It became evident that the Cisnes is identical with the Rio Frias discovered by Argentine explorers; but although the country improved, and, as on the upper courses of the Aisen, Palena, and other Patagonian rivers, showed itself well adapted for cattle-rearing, no trace of settlement was met with. It therefore became necessary, owing to the scarcity of supplies, to turn to the south-east, and make for the settlements on the Senguer, east of the main watershed. This proved to be lower and less steep than further west, so that, pressing forward with two men only, Dr. Steffen was able, after his supplies had been entirely spent, to reach the Casa Steinfl, east of Lake Fontana, and to send help to his party. The explorers returned to the Rio Frias by a more northerly route, and subsequently proceeded north-north-east, crossing and recrossing the continental divide, and striking the caravan route to Lake Nahuelhuapi in the valley of the Rio Teca. Dr. Steffen was able to prove that the water-parting, though falling within the system of the Andes, is not here formed by continuous snowy ridges, but lies considerably to the east of the line of highest summits. The report gives many instructive details respecting the physical geography of the region, which is also illustrated by numerous reproductions of Dr. Steffen's photographs.

AUSTRALASIA AND POLYNESIA.

The Boring at Funafuti.—Information regarding the recent boring operations at Funafuti is given in the Sydney *Daily Telegraph*. The most interesting part of this year's work consists in the boring in the lagoon of the atoll, which has been carried out from the bows of H.M.S. *Porpoise*. During the first twenty-four hours a depth of 109 feet below the bottom of the lagoon was attained, the depth of the water being 103 feet. The first 80 feet consisted of sand, composed of joints of the seaweed *Halimeda*, and of fragments of shells. Below that depth fragments of coral appeared, becoming progressively larger at the deeper levels. From more recent information supplied by Prof. Bonney (*Nature*, November 10), it appears that at the depth of 144 feet hard coral rock was reached, which stopped the operations, owing to the great length of unsupported pipe. A second boring was, however, commenced nearer the centre of the lagoon, the limit of sand being again reached at 80 feet, below which a rather hard coral gravel was found. This was pierced to a depth of 33 feet, when work was abandoned, owing to the necessary departure of the *Porpoise*. The old bore on the main island of Funafuti, which terminated last year at 698 feet, has been continued downwards, the cleaning and relining having been successfully accomplished. On August 15 a depth of 840 feet had been reached, a hard rock largely composed of coral and shells having been struck. The depth mentioned is exactly that at which a strongly marked shelf occurs on the outer face of the reef, which has been supposed to mark the downward limit of coral formation, so that, as operations have since been continued, some specially valuable results should have been obtained.

Dr. Lauterbach on the Geographical Results of the Kaiser-Wilhelms-Land Expedition.—An instructive sketch of the geographical results of the expedition which successfully explored the interior of German New Guinea in 1896, is given by Dr. Lauterbach in the *Zeitschrift* of the Berlin Geographical Society (1898, No. 3). The writer describes in turn the chief physical features of the country traversed, beginning with the shores of Astrolabe bay, and coming next to the plain which lies at the head of it. This he describes in some detail, as many of its characteristics may be regarded as typical, in a general way, of the whole region. Covered for the most part with tall forest, its mammalian fauna is extremely poor, whereas bird life is particularly well developed. Everywhere up to 3000 feet and more, Dr. Lauterbach elsewhere remarks, the woods resound with the most varied bird-notes. The Tajomanna (Oertzen) mountains which bound the plain to the west, and which may be regarded as an extension of the Finisterre range, consist of a core of old volcanic rocks, flanked by sedimentary deposits. Exposed to the full force of the north-west monsoon, they receive a large rainfall, and the streams which descend from them to the Astrolabe plain contain water throughout the year. Of the Ramu, the large river discovered in the interior, we learn that in the parts explored its breadth varies from 80 to over 300 yards, while in places its bed exceeds half a mile in width. In the current the depth is generally from 10 to 15 feet, and is rarely less than 6 feet. Canoes, which vary in form as the stream is descended, are everywhere employed by the natives. The vegetation of its banks, though rich in species, presents a uniform aspect. Forest (in which deciduous trees of the families Combretaceæ, Bignoniaceæ, and Bombaceæ are especially plentiful) covers the high concave banks, while a growth of wild sugar-cane is seen on the lower convex side of the bends. In the lower course coconut palms line the banks, and primeval forest is little seen owing to the dense population. In places the Ramu closely skirts the spurs of the Bismarck range, from which it receives many important tributaries; one of these has formed a broad and deep valley, which seems to separate the Bismarck range from another to the west, which Dr. Lauterbach proposes to call Hagen range. Owing to the neighbourhood of the mountains, the meteorological conditions are very different in the Ramu valley from those of the Astrolabe plain. The Bismarck range forms an important mountain *massif*, which apparently has a considerable breadth from north to south, and is connected with the Albert Victor and Sir Arthur Gordon ranges in British territory. Where examined, it consisted of a number of parallel chains, running chiefly from north-west to south-east, and rising steeply to a height of over 13,000 feet. Dr. Lauterbach thus sums up the general features of the region traversed: A vast chain, consisting mainly of old crystalline rocks, and rising to heights of over 13,000 feet, traverses New Guinea from north-west to south-east. Extensive plains, traversed and in part built up by the Empress Augusta and Ramu rivers, lie to the north of this range; while, on either side of their mouths, chains of lesser elevation, in part composed of recent coral limestone, run parallel to the coast. South of Astrolabe bay the great Finisterre range, also parallel to the coast, encloses the Ramu valley between itself and the Bismarck range. The interior valleys, as also the lower ranges, are thinly peopled, whereas the lower courses of the streams, especially that of the Ramu, are occupied by an extremely dense population. Agriculture is practised everywhere. Granted that there are no hindrances to navigation in the lowest part of its course, the Ramu supplies an excellent waterway to the best agricultural plains of the country, and an easy means of access to the foot of the central mountain chain.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Thermo-Geographical Studies.—In the handsome volume* recently published at the expense of the "Carlsbergfondet," Copenhagen, we find another attempt to solve the problem of expressing the temperature variations of the atmosphere at any point on the Earth's surface by means of mathematical formulæ. The author, Mr. C. L. Madsen, was awarded the Hodgkins Medal (1895) by the Smithsonian Institution for this essay. The thermo-geographical problem is here made to include, not only the analytical determination of the normal mean yearly temperature of a place of given geographical position, but also of the annual movement in temperature, as defined by the corresponding normal mean monthly temperatures. In other words, it is required to find, first, an equation which shall accurately express the mean annual temperature at any place in terms of the terrestrial position of that place; and, second, an equation which shall represent the mean temperatures of the successive months in terms of the mean annual temperature, and certain local or position constants to be determined. In both cases the further, and hitherto fatal, condition is imposed, that the form of the mathematical expressions must be sufficiently simple to allow of their use in practical work. In the first part of the investigation, the author obtains the mean annual temperature of a series of points from the isothermal charts of Buchan, Hann, and others. From these, the average annual temperature of each parallel of latitude is found by interpolation, and the difference between the interpolated mean at any meridian on the parallel and this average is the "annual thermo-geographical component" of the point of intersection. This component the author believes to be a quantity of exceptional interest in itself, as representing the disturbance of the temperature of a place from what is properly due to its latitude. After applying a series of corrections to the "components," two equations are formed, one for the northern and another for the southern hemisphere, which differ widely in the values of their constants, but agree in including all variable quantities in a single "cos ϕ" term, which occurs only in its first and second powers. So far, there is a distinct advance in the direction of simplicity, but this is scarcely maintained in the determination of the values of the variable function. The

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* 'Thermo-geographical Studies: General Exposition of the Analytical Method applied to Researches on Temperature and Climate.' By C. L. Madsen. Copenhagen: G. E. C. Gad, Bookseller to the University.

Atlantic middle zones of the northern hemisphere, for example, are subdivided into areas, for each of which special formulæ have been constructed by means of the method of least squares, and the value of the variable in the general equation has to be computed from these in each case. The expression for the monthly variations of temperature is of course more complicated, as the local effects have to be further taken into account, and varying astronomical considerations are involved. The method followed is to a certain extent the same, but the result now contains two important sets of coefficients, the "dynamo-cosmical" and the "thermo-geographical." The values of the latter are found to be independent of the annual mean temperatures, and hence to furnish a convenient numerical definition of climate. It is proposed to arrange them in seven groups, representing seven separate types of climate, viz.—

Value of coefficient in degrees C.	Definition of climate.	Class.
0°–3°	Tropical and extreme insular	I.
3°–4°	Extreme coast	II.
4°–6°	Normal ,,	III.
6°–9°	Normal continental	IV.
9°–11°	Central ,,	V.
11°–15°	Extreme ,,	VI.
Over 15°	Polar	VII.

We select the following examples at random from a large number of cases worked out for different latitudes: Class I., Valentia; II., Edinburgh; III., London; IV., Warsaw; V., Kazan; VI., Krasnoyarsk; VII., Yakutsk.

A New Deep-sea Expedition.—Early in November an expedition, organized by Mr. George Murray, Keeper of the Botanical Department of the Natural History Museum, left London for the purpose of investigating the fauna of the intermediate oceanic depths. Different opinions have been held by naturalists as to the existence of living organisms in the vast intermediate zone between the upper and bottom belts, Prof. A. Agassiz, in particular, holding that this is devoid of life, while Sir John Murray and others hold that the ocean is inhabited throughout its whole depth. Appliances designed for the collection of organisms from stated layers only having proved unsatisfactory, the new expedition will employ the method whereby collections are made from different depths by a vertical series of tow-nets, gradually lowered through the water, Sir John Murray having found that by increasing the depth at which the nets are towed, new forms of life are obtained in addition to those collected from the surface layers. Work was to be commenced at the edge of the 100-fathom platform, about 30 miles from the west coast of Ireland, and it was proposed to steam slowly westwards, increasing the number of nets employed until, when the chain reached a depth of 2000 fathoms, 38 would be in use. The *personnel* of the party includes Mr. V. H. Blackman and Dr. Gregory, of the Natural History Museum, Mr. J. E. S. Moore, the investigator of the fauna of Lake Tanganyika, Dr. Sambon, and Mr. Highley, an artist. The s.s. *Oceana* has been chartered for the expedition, and valuable assistance was afforded for the outfit by the Silvertown Cable Co. Grants of money have been made by our Society, and the Drapers' and Fishmongers' Companies.

Soundings in the South Pacific.—We have received a copy of a special report, published by the Admiralty, on the cruises of H.M. SS. *Penguin* and *Waterwitch* in search of reported dangers in the South Pacific to the northward of Fiji.

The systematic investigation of the depths in the South Pacific was begun in 1888 by H.M.S. *Egeria*, and ceased in the following year. Between 1890 and 1894 only isolated soundings were obtained, but regular work was resumed in 1895, and has been continued. The present report contains detailed accounts of the cruises of the two vessels by Commander J. W. Combe, of the *Waterwitch*, and Captain A. M. Field of the *Penguin*, and lists of soundings and temperature observations are appended. The existence of the *La Brillante* shoal and the *Melanie* rock has been disproved, and many additions and corrections have been made in the charts. Both vessels obtained excellent lines of soundings on their voyages to and from Sydney and Hobart, and various routes for a cable to Fiji are now thoroughly investigated.

The Determination of Longitudes by Photography.—We have received from the author a copy of a reprint, from the *Memoirs of the Royal Astronomical Society*, of a paper on the determination of terrestrial longitudes by photography, by Captain E. H. Hills, R.E. Captain Hills gives the result of extended experience of the method in the field, and reduces it to a practical form at once available to travellers and explorers. Minute instructions are given for making the necessary observations and exposures, and all the precautions to be taken by inexperienced observers are clearly pointed out; the measurements of the plates are described, and an example of the method of computation, due to Prof. Turner, is given in full. The advantages of the photographic over a visual method are the small amount of work actually required in the field, and the slight demands made on the skill of the observer to obtain results of a high standard of accuracy. Against these must be set the disadvantages of not obtaining results which are immediately available, and of the unavoidable weight of the camera and its stand, a high degree of stability being absolutely essential.

GENERAL.

Memorial to General Woodthorpe.—We call the attention of Fellows of our Society to the fund which has been started for a memorial to the late Major-General R. G. Woodthorpe, whose valuable services to geography on the Indian frontiers are well known to our readers. It has not yet been decided what form the memorial shall take, but it is mentioned in this connection that the blind brother of the deceased officer has been left by his death in very straitened circumstances. The secretaries to the fund are Colonel C. R. MacGregor, C.B., and Major F. B. Longe, R.E., and subscriptions will be received in this country by Messrs. Henry S. King & Co., 45, Pall-mall.

OBITUARY.

Lieut.-General Sir William H. Goodenough, R.A., K.C.B.

By the PRESIDENT.

THE late Lieut.-General Sir William H. Goodenough, K.C.B., had been a Fellow of this Society for thirty-four years, and had served on our Council. The news of his sudden death at the Cape, last October, was received with regret, and with a deep sense of the loss that has been sustained by the service, and by a large circle of friends.

William Howley Goodenough was born on April 5, 1833, being the third son of Dr. Edmund Goodenough, the Head Master of Westminster, and afterwards Dean of Wells, by Frances, daughter of Samuel Pepys Cockerell, Esq. He was brother of our lamented associate, Commodore James G. Goodenough, C.B., C.M.G. William H. Goodenough went to Westminster at the age of twelve, and always retained his affection for the old school. He went down to ask for an "early play" on his appointment to the command at the Cape. He went from Westminster to the Woolwich Academy, where he specially distinguished himself, and became a second lieutenant R.A. in December, 1849, and captain in 1856. During the Indian Mutinies he served in the action of Pandi Nadi, at the siege and capture of Lucknow, and at the attack and capture of Fort Birwah. During his Indian service he was severely wounded three times. He was promoted to the rank of major in 1858, lieut.-colonel in 1869, and colonel in 1877. In 1864, Colonel Goodenough became a Fellow of our Society. From 1871 to 1874 he was military attaché at Vienna, and in 1874 he married the Countess Anna Kinsky, by whom he has four daughters. He was assistant adjutant-general at Woolwich from 1874 to 1876, and at the Horse Guards from 1876 to 1881. In 1882 he commanded the artillery during the Egyptian Campaign, and was created a C.B. From 1886 to 1889 he was Inspector-General of Artillery at head-quarters, became a major-general in 1886, and commanded the Thames District from 1889 to 1892. He became a lieut.-general in 1891. He was a warm supporter of the National Artillery Association; and jointly with Colonel Dalton, R.A., he published the 'Army Book for the British Empire' in 1893.

General Goodenough was an ardent geographer, and he took an hereditary interest in the progress and welfare of this Society; for his father, the Dean of Wells, was an original member, and contributed a learned paper to the first volume of our *Journal*. His brother, my old messmate, Commodore Goodenough, was a valued Fellow of the Society, who was never tired of sending us information of geographical interest, and helping us in every way in his power. Both brothers were members of the Geographical Club. General Goodenough became a member of our Council in 1894, and remained on it until he was appointed to the command of the troops in South Africa. He went out in December of that year, and was twice acting governor. He was created K.C.B. in 1897. He died suddenly, of pneumonia, on October 24, 1898; but he had been on leave to St. Helena, for his health, in the previous year.

William Goodenough, as a boy, displayed abilities far above the average, and was so far in advance of the other cadets of his batch that he passed out of the Woolwich Academy and got his commission a year in advance of them. As an officer he was remarkable for his ability and zeal, and for the deep interest he took in all questions connected with the good of the service, and especially with the welfare of the men. Latterly he was a great reader, and was remarkably well informed, taking special interest in social and historical questions, while his thorough knowledge of geography made him a great acquisition to our Council. Goodenough's most amiable and sympathetic character endeared him to a very great number of friends. He never changed, there was always the same genial warm-hearted welcome from him, and the present writer can speak of an unbroken friendship of more than fifty-four years. Honourable, high-principled, and zealous, he will long be missed, both in the service of which he was an ornament, and by the relations and friends who mourn his loss.

Sir Henry Barkly, G.C.M.G., K.C.B.

Sir Henry Barkly, a former Vice-President of our Society, died at his residence in South Kensington on October 21, at the advanced age of eighty-three years.

The deceased was the only son of Mr. Æneas Barkly, a native of Ross-shire, but with a business in London in connection with the West India trade. Educated at Bruce Castle School, Tottenham, Henry Barkly followed in his father's footsteps, and, by his devotion to business, acquired a practical experience which served him in good stead in his after life. From 1845 to 1849 he sat in Parliament as member for Leominster, and was throughout a warm supporter of Sir Robert Peel in his commercial policy. His official connection with the colonies, in the service of which the best part of his mature life was spent, began in 1849, in which year he became Governor and Commander-in-Chief of British Guiana, where he owned property. In this capacity he did valuable service to the colony, and deserves to be remembered above all for his advocacy of the introduction of coolie labourers from the east, which has since met with considerable success. In 1853 he was created a K.C.B., and in the same year was transferred as Governor to Jamaica, where he remained three years. In 1856 he was appointed Governor of Victoria; and in 1863, of Mauritius. From 1870 to 1877 he was Governor of the Cape of Good Hope, and it was during his tenure of the office that "responsible government" was established in that colony (1872). In 1874 he was made a G.C.M.G., and in 1877 he retired on a pension. In 1879 he served on the Royal Commission on the Defence of British Possessions abroad. He became a member of our Society in 1870, and served on its Council from 1879 to 1883, and from 1885 to 1889, occasionally taking part in the discussions at the evening meetings. He was twice married—in 1840, and again in 1860.

CORRESPONDENCE.

Common Sense at Last.

Among the latest news from India is an item that ought to gratify geographers. An officer of the Russian General Staff has visited India, has been hospitably entertained, and, so to say, shown over the north-west frontier, or at least some of the most interesting and, in a military sense, important sections of it. This is as it ought to be, and is no more than a fair return for the courtesy and absence of reserve shown by the government of the Tsar to the many Englishmen, both military men and civilians, who have travelled in Russian Asia of late years. May we not hope that it has come to be realized at Simla that all attempts to draw a curtain along a frontier thousands of miles in extent are not less futile than undignified, and that henceforth it will not be thought indispensable to stamp every scrap of mapping done by our surveyors on or beyond the frontier with the fatal word "Confidential," the sole result of which is to vex innocent students and hinder the spread of geographical knowledge? Some pertinent remarks were made in this connection by Mr. Black when reviewing an annual Survey Report of the Government in our *Journal* not long ago; and I would venture to supplement these by respectfully suggesting that the Council of the R.G. Society might urge on the Secretary of State for India the publication of the maps of portions of Baluchistan and of Persia which have been prepared in recent years, but are at present carefully withheld from general knowledge.

M. R. Haig, Major-General.

October, 1898.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1898–1899.

First Ordinary Meeting, November 14, 1898.—Sir Clements Markham, K.C.B., President, in the Chair.

Elections.—*Rev. Alexander Dewar; G. A. Dolby; The Duke of Hamilton; Robarts Harper; Alfred Hughes; Lieut.-General Sir Stephen Bartlett Lakeman; A. Kingsley Macomber; Colonel Charles Henry Tilson Marshall (Indian Staff Corps); Charles Spargo; Captain Edward A. Stanton (Oxfordshire Light Infantry).*

The Paper read was:—

"The President's Opening Address, Session 1898–99."

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Croatia. *Deutsche Rundschau G.* **21** (1898): 22–28. **Umlauft.**

Die Plitvicer Seen in Kroatien. Von Prof. Dr. Friedrich Umlauft. *With Map and Illustrations.*

Austria—Graz. *Sitzb. k. A.W. Wien* **107**, Abth. IIa. (1898): 167–181. **Hann.**

Ueber die Temperatur von Graz Stadt und Graz Land. Von J. Hann.

The mean annual minimum temperature for the town of Graz is 6° Fahr., the mean maximum 89° Fahr., a range of 83°; while for the immediately surrounding country the mean annual minimum is −3°·3, and the maximum 87°·5, a range of 90°·8; thus showing the more extreme character of the country climate.

Austria—Triest. *Sitz. k. A.W. Wien* **106**, Abth. IIa. (1897): 685–721. **Mazelle.**

Tägliche Periode des Niederschlages in Triest. Von Eduard Mazelle.

On the daily periodicity of rainfall in Triest.

Austria—Tyrol. *M. k.k. G. Ges. Wien* **41** (1898): 477–491. **Walde.**

Zur Besiedelung Tirols durch illyrische Stämme. Von Dr. Alois Walde.

A study of some of the place-names of Northern Tyrol with reference to their Illyrian origin.

Austria-Hungary—Bosnia. **Freeman.**

Trade of Bosnia and the Herzegovina for the year 1897. Foreign Office, Annual No. 2167, 1898. Size 10 × 6½, pp. 10. *Price* 1*d.*

Austria-Hungary—Bosnia. *B.S.R. Belge G.* **22** (1898): 295–304. **Hontoir.**

Une visite à la station météorologique de la Bielasnica en Bosnie. Par E. Hontoir.

Austria-Hungary—Earthquakes. **Mojsisovics.**

Sitz. k. A. W. Wien **107**, Abth I. (1898): 195–433.

Mittheilungen der Erdbeben-Commission der kaiserlichen Akademie der Wissenschaften in Wien. V. Allgemeiner Bericht und Chronik der im Jahre 1897 innerhalb des Beobachtungsgebietes erfolgten Erdbeben zusammengestellt von Dr. Edmund v. Mojsisovics.

France—Ain. **Corcelle.**

Géographie militaire du département de l'Ain. Par J. Corcelle. Bourg. Size 8½ × 5½, pp. 12. *Presented by the Author.*

France—Aveyron. **Durand and Lapouge.**

B.S. Languedoc. G. **20** (1897): 285–315, 461–476; **21** (1898): 30–59.

Matériaux pour l'Anthropologie de l'Aveyron. Par le Dr. Durand et G. de Lapouge.

France—Eastern. *B.S.G. de l'Est* (1898): 74–83. **Bleicher.**

Notes et souvenirs des excursions de la Société de Géographie de l'Est à Essey-la-Côte et à la côte de Sion. Par M. le Professeur Bleicher.

France—Lyons. *B.S.G. Lyon* **15** (1898): 177–224. **Devaux.**

Les noms de lieux dans la région lyonnaise aux époques Celtique et Gallo-Romaine. Par M. l'Abbé Devaux.

A study of the ancient place-names of the region near Lyons.

France—Montpellier. *B.S. Languedoc. G.* **21** (1898): 123–172. **Vigié.**

Des Enceintes successives de la ville de Montpellier et de ses fortifications. Par M. Vigié.

France—Southern. *Mém. S. Spéléologie* **2** (1898): 1–246. **Mazauric.**

Le Gardon et son Cañon inférieur. Par M. Félix Mazauric. *With Plans.*

Germany—Berlin. *Meteorolog. Z.* **15** (1898): 321–332. **Börnstein and Less.**

Die Temperaturverhältnisse von Berlin. Von R. Börnstein und E. Less.

An elaborate discussion of the temperature records of Berlin, one of the results of which is to show that the house-roofs of a city play the same part in influencing temperature as the ground does, with the result that the temperature observed immediately above the roofs is more representative of the locality than that observed on the ground or at a window.

Hungary—Banat. *Deutsche G. Blätter* **21** (1898): 65–88 **Braess.**

Die Schwaben im Banat. Von Dr. Martin Braess.

An interesting sketch of the history of the immigration of South Germans into the Banat, and the customs of their descendants.

Hungary—Rain and Rivers. **Hegyfoky.**

Mathemat. u. Naturw. Berichte Ungarn **14** (1898): 239–284.

Wasserstand der Flüsse und Niederschlag in Ungarn. Von J. Hegyfoky.

A study of the data for precipitation and river-level in Hungary.

Italy. **Smith.**

A Pilgrimage to Italy. An account of a Visit to Brindisi, Naples, Mount Vesuvius, Pompeii, Rome, Florence, Venice, and Milan. By the Rev. James Smith, B.D. Part i. Aberdeen, 1898. Size 9 × 6, pp. 1–64. *Map and Illustrations. Price* 1*s. Presented by the Author.*

Italy—History. **Stillman.**

The Union of Italy, 1815–1895. By W. J. Stillman. Cambridge: The University

Press, 1898. Size 8 × 5½, pp. x. and 412. *Maps. Price 6s. Presented by the Publishers.*

The author traces the progress of the unification of Italy, illustrating the various steps by historical maps. He speaks from an intimate knowledge of Italian public life extending over nearly forty years, and, in looking forward to the future of the country, feels compelled to the pessimistic conclusion, "Too quickly and too easily was Italy made." He brings forward the evidence which leads him to this opinion.

Italy—Sicily. **[Ludwig Salvator.]**

Ustica. Prag: Heinr. Mercy Sohn, 1898. Size 16½ × 13, pp. xii. and 132. *Maps and Illustrations. Presented by H.I.H. the Archduke Ludwig Salvator.*

The Archduke Ludwig Salvator has produced another of the superb folios of which he has devoted so many to the description and delineation of the islands of the Mediterranean. The little island of Ustica lies north of Palermo, considerably to the west of the Lipari group, and is, roughly speaking, two miles in diameter. It is treated very fully in all its aspects, including the primitive methods of agriculture employed by the people.

Italy—Umbria. *B.S.G. Italiana* **11** (1898): 488–499. **Baratta.**

Sulla distribuzione topografica dei terremoti nell' Umbria. Comunicazione del socio M. Baratta. *With Map.*

On the distribution of earthquakes in Umbria.

Montenegro. *B.S.G. Italiana* **11** (1898): 499–505. **Baldacci.**

Il mio settimo viaggio nel Montenegro. Lettera del socio. Dott A. Baldacci.

Pyrenees. **Spender and Smith.**

Through the High Pyrenees. By Harold Spender. With Illustrations and Supplementary Sections by H. Llewellyn Smith. London: A. D. Innes & Co., 1898. Size 9 × 6, pp. xii. and 370. *Map. Price 16s. Presented by the Publishers.*

Describes journeys through the Pyrenees, with a full account of Andorra, and advice as to mountaineering excursions.

Sweden. **Constable.**

Trade of Stockholm and the Eastern Coast of Sweden for the year 1897. Foreign Office, Annual No. 2062, 1898. Size 10 × 6, pp. 36. *Price 2½d.*

Sweden. **Herbert.**

Report on the Foreign Trade, Mineral Production, etc., of Sweden. Foreign Office, Annual No. 2028, 1898. Size 9½ × 6½, pp. 22. *Price 1½d.*

Sweden—Geological Survey. ——

Sveriges Geologiska Undersökning. Ser. C. No. 161 A and B, Om Skandinaviens Geografiska Utveckling efter Istiden, af Gerard de Geer. Text and Maps (1896, pp. 160); No. 165, Om högsta Marina Gränsen i norra Sverige, af A. G. Högbom (1896, pp. 26, map); No. 166, Den centraljämtska Issjön, af Gunnar Andersson (1897, pp. 38, maps); No. 167, Maddelanden om jordstötar i Sverige, af E. Svedmark, V. (1897, pp. 30, map); No. 169, Några anmärkningar om de Isdämda Sjöarne i Jemtland, af A. G. Högbom (1897, pp. 18); No. 171, Om de geologiska förhållandena i trakten omkring Sjangeli Kopparmalmsfält i Norrbottens Län, af Walfr. Petersson (1897, pp. 14, map); No. 173, Om rullstensåsarnes Bildningssält, af Gerard de Geer (1897, pp. 26); No. 174, Sveriges Geologiska Undersöknings Utställning vid allmänna Konst- och Industri-Utställningen i Stockholm 1897 jemte meddelanden om Institutionens Verksamhet Landets geologiska Beskaffenhet och Tillgångar af Malmer, Användbara berg- och jordarter M.M., af Edvard Erdmann (1897, pp. 54, plate); No. 175, Kiirunavaara och Luossavaara jernmalmsfält i Norrbottens Län, af Hjalmar Lundbohm (1898, pp. 72, map and plates). Stockholm. Sizes 9 × 6, 9 × 6½, 9½ × 6½, 10 × 6½.

Sweden—Gothenburg. **Duff.**

Trade of Gothenberg and District for the Year 1897. Foreign Office, Annual No. 2161, 1898. Size 10 × 6, pp. 44. *Price 2½d.*

Switzerland. *Quarterly J. Geolog. S.* **54** (1898): 279–289. **Jennings.**

The Structure of the Davos Valley. By A. Vaughan Jennings.

Switzerland—Statistics. ——

Annuaire Statistique de la Suisse. Publié par le Bureau de Statistique du Département Fédéral de l'Intérieur. Septième Année, 1898. Bern, 1898. Size 9½ × 6½, pp. iv. and 454.

United Kingdom. *Quarterly J. Geolog. S.* **54** (1898): 251–278. **Codrington.**

On some Submerged Rock-valleys in South Wales, Devon, and Cornwall. By T. Codrington.

United Kingdom. **Johnson.**

The Imperial Library. Imperial Britain. A comprehensive description of the Geography, History, Commerce, Trade, Government, and Religion of the British Empire. Vol. i. The British Empire in Europe, etc. By the Rev. Theodore Johnson. London: The Imperial Press, 1898. Size 9 × 6, pp. xvi. and 296. *Maps and Illustrations. Presented by the Publishers.*

The scope of the work, of which this is the first volume, is indicated in the preface thus: "Under this comprehensive and noble title, the author has endeavoured to represent the geography, history, commerce, trade, government, and religion of the vast territories and possessions of the British Empire, which now comprises one-sixth of the Earth's surface, with a population numbering one-fifth of the inhabitants of the whole world." The description of the English lakes is incomplete and inaccurate, and the work as a whole might be improved by revision.

United Kingdom. **Lyde.**

A Geography of the British Isles. By Lionel W. Lyde. London: A. & C. Black, 1898. Size 7 × 5, pp. vi. and 128. *Price* 1*s*. *Presented by the Publishers.*

This is a new text-book which deserves success. The subject is handled with regard to the broad principles of geography, and at the same time with due attention to accuracy of detail. The facts which are stated are carefully selected, and treated so as to bring out the causes on which they depend, and although there are no illustrations, the book is attractively written, and bears throughout marks of the experience of the author in practical teaching.

United Kingdom—England. **Baedeker.**

London and its Environs. Handbook for Travellers. By Karl Baedeker. With 3 Maps and 20 Plans. Eleventh Revised Edition. Leipsic: Karl Baedeker; London: Dulau & Co., 1898. Size 6½ × 4½, pp. x., 438, and 44. *Presented by Messrs. Dulau & Co.*

United Kingdom—England. **Cuttriss.**

P. Yorkshire Geol. and Polytechnic S. **13** (1898): 311–324.

Notes on the Caves of Yorkshire. By S. W. Cuttriss.

A general sketch of the geological formations in Yorkshire favouring the formation of caves, with an account of the recent exploration of Troller's cave in Wharfedale and Attermire cave near Settle, a plan and section of which are given. In referring to the history of cave-exploration in Yorkshire, the work of M. Martel is not noticed.

United Kingdom—England. *Natural Science* **13** (1898): 109–114. **Dawson and Hewitt.**

Natural Gas in Sussex. By Charles Dawson.

On the Discovery of Natural Gas in East Sussex. By C. Dawson.

Note on Natural Gas at Heathfield Station (Sussex). By J. T. Hewitt, D.SC., etc.

Natural gas has been struck by two borings for water near Heathfield, in Sussex; but the extent of the supply has not been ascertained, nor the gas utilized.

United Kingdom—England. **Fox-Strangeways.**

P. Yorkshire Geol. and Polytechnic S. **13** (1898): 338–345.

Filey Bay and Brigg. By C. Fox-Strangeways. *With Plates.*

A series of five pictures showing the structure of the Yorkshire coast and the contrast in the forms of the land, due to the overlying boulder clay and the underlying Jurassic rocks of alternate limestone and compact clay.

United Kingdom—England. **Harrison.**

The Place-Names of the Liverpool District; or, the History and Meaning of the Local and River-Names of South-west Lancashire and of Wirral. By Henry Harrison. London: Elliot Stock, 1898. Size 8 × 5½, pp. 104. *Presented by the Publisher.*

United Kingdom—England. *J.R. Agricultural S.* **9** (1898): 286–316, 512–550. **Bear.**

Flower and Fruit Farming in England. By William E. Bear.

The recent great increase in the growing of flowers and fruit on a large scale has led to the inquiry here described. From the Scilly Isles—the conditions of which are fully described in the paper—no less than 514 tons of cut flowers were exported in

1896; the islands contain 503 acres under flowers, mainly narcissus. The export of flowers begins in December, and goes on until June. The Lincolnshire and Wisbech bulb-farms are also described in some detail, and the flower-growing in the neighbourhood of London is treated at length.

United Kingdom—England. *Contemporary Rev.* **74** (1898): 137–152. **Harrison.**
Ideal London. By Frederic Harrison.

This delightful lecture says much about the real character a city ought to possess, and indicates the lines of improvement practicable in the special instance selected.

United Kingdom—England. *Archæologia* **55** (1897): 409–430. **Hope.**
Excavations on the site of the Roman city at Silchester, Hants, in 1896. By W. H. St. John Hope. *With Plans and Illustrations.*

United Kingdom—England. **Joanne.**
Collection des Guides-Joanne. Londres et ses Environs. 34 Plans et 6 Cartes. Paris: Hachette et C^{ie}, 1898. Size 6½ × 4½, pp. iv. and 374.

United Kingdom—England. **Nares.**
Report on the Present State of the Navigation of the River Mersey (1897), to the Right Honourable the Commissioners for the Conservancy of the River Mersey. By Vice-Admiral Sir G. S. Nares, K.C.B., F.R.S. London: Metchim & Son, 1898. Size 9½ × 6, pp. 16.

United Kingdom—Rainfall. **Symons and Wallis.**
British Rainfall, 1897. On the Distribution of Rain over the British Isles during the year 1897, as observed at more than 3000 stations in Great Britain and Ireland, with articles upon various branches of rainfall work. Compiled by G. J. Symons, F.R.S., and H. Sowerby Wallis. London: E. Stanford, 1898. Size 9 × 6, pp. 60 and 240. *Maps and Diagrams. Price* 10*s. Presented by the Author.*

The current issue of *British Rainfall* contains an important paper and maps on the rainfall of the Lake District.

United Kingdom—Scilly Islands. *Travel* **3** (1898): 130–135. **Denny.**
Wanderings in the Scilly Archipelago. By Professor A. Denny. *With Illustrations.*

United Kingdom—Scotland. **Ellice.**
Place-Names in Glengarry and Glenquoich and their Origin. By Edward C. Ellice. London: Sonnenschein & Co., 1898. Size 8 × 5½, pp. viii. and 128. *Illustrations and Map. Presented by the Publishers.*

United Kingdom—Shetland. *J. Manchester G.S.* **13**, 1897 (1898): 125–138. **Russell.**
The Shetland Islands. By E. J. Russell, B.SC. *With Map.*

United Kingdom—Sugar-Beet. **Lawes and Gilbert.**
J.R. Agricultural S. **9** (1898): 344–370.
The Growth of Sugar-Beet, and the Manufacture of Sugar, in the United Kingdom. By Sir John Bennet Lawes and Sir J. Henry Gilbert.

A careful investigation into the probability of the profitable growth of the sugar-beet in Great Britain, with details of experiments which have been made. The conclusions arrived at are that it is possible to cultivate the beet in many parts of the country; but that in only a few places, such as Norfolk and Suffolk, would it be likely to prove very successful; and even there only in the case of the price of sugar exceeding £9 per ton.

United Kingdom—Tide Tables. **Harris and Goalen.**
Tide Tables for the British and Irish Ports, for the year 1899: also the Times and Heights of High Water at Full and Change for the principal places on the Globe. By Captains H. R. Harris and W. N. Goalen. London: J. D. Potter [1898]. Size 10 × 6½, pp. xl. and 262. *Price* 2*s. Presented by the Admiralty.*

ASIA.

Caspian Sea. *Naturw. Wochenschrift* **13** (1898): 433–439. **Lang.**
Der Adschidarja. Von O. Lang. *With Sketch-maps.*

On the lagoon of Ajidaria, on the east side of the Caspian.

China. *B.S.G. Marseille* **22** (1898): 5–38. **Brenier and Grosjean.**
Dix-huit mois de mission en Chine. Conférence de MM. H. Brenier et A. Grosjean. *With Map.*

China. *J. Manchester G.S.* **14** (1898): 113–129. **Bullock.**
The Geography of China. By Consul T. L. Bullock. *With Map.*

China. *Mem. (Zap.) S. Imp. Russe G.* **33** (1898): 1–38. **Lauwaert.**
Observations Barométriques faites à Hoï-Hien, au Sud de Kan-Sou, en Chine, en 1892–1893. Par M. Lauwaert. Arrangées par M. Bérézowski.

China. *B.S.R.G. d'Anvers* **22** (1898): 143–155. **Reclus.**
L'Extrême-Orient. Par M. Elisée Reclus. *With Map.*

China. *B.S.G. Com. Paris* **20** (1898): 317–338, 465–513. **Rocher.**
Notes de Voyage en Chine Centrale, D'Amoy à Han-kao.—A travers le Fou-kien, le Kiang-si, le Hou-nan et le Hou-pé. Par M. Rocher. *With Map.*

China. *Contemporary Rev.* **74** (1898): 457–473. **Younghusband.**
England's Destiny in China. By Captain F. E. Younghusband.

China—Kwang-si. *Questions Dipl. et Colon.* **5** (1898): 86–93. **Brenier.**
Notes à propos de la révolte au Kouang-Si. Par M. Brenier. *With Map.*

Refers principally to the variety of different races and classes of the people of the province, and to their social and political organization.

China—Languages. **Madrolle.**
C. Madrolle. Les Peuples et les Langues de la Chine Méridionale. Parlers de l'Ile d'Hai-Nan et de la presqu' île du Loui-tcheou (Louei-Tsiou) suivis de quelques expressions des Peuples originaires des Régions voisines du Tibet. Paris: A. Challamel, 1898. Size 10 × 6½, pp. 16. *Map.*

On the languages spoken in the south of China.

China—Manchurian Railway. ———
Russia. No. I. (1898). Despatch from Her Majesty's Ambassador at St. Petersburgh, enclosing an Agreement concluded between the Chinese Government and the Russo-Chinese Bank for the Construction of the Manchurian Railway. London: Eyre & Spottiswoode, 1898. Size 13 × 8½, pp. 10. *Price* 1½*d.*

China—Railways. *A travers le Monde, Tour du Monde* **4** (1898): 313–316. **Combes.**
Les Chemins de fer de la Chine. Par M. Paul Combes. *With Map.*

China—Wuchow. **Hosie.**
Trade of Wuchow for the year 1897. Foreign Office, Annual No. 2168, 1898. Size 10 × 6½, pp. 24. *Price* 1½*d.*

China—Yangtse. **Carles.**
The Yangtse Chiang. By W. R. Carles. (From the *Geographical Journal* for September, 1898.) Size 10 × 6½, pp. 16. *Maps.*

Dutch East Indies. **Van der Chijs.**
Nederlandsch-Indisch Plakaatboek, 1602–1811. Door Mr. J. A. Van der Chijs. Zestiende Deel. 1810–1811. 's Hage: M. Nijhoff, 1897. Size 9 × 5½, pp. 816.

Dutch East Indies. **Van der Chijs.**
Dagh-Register gehouden int Casteel Batavia vant passerende daer ter plaetse als over geheel Nederlandts-India Anno 1668–1669. Uitgegeven door het Bataviaasch Genootschap van Kunsten en Wetenschappen . . . van Mr. J. A. Van der Chijs. Batavia, 1897. Size 11 × 7½, pp. 518.

French Indo-China. *A travers le Monde, Tour du Monde* **4** (1898): 305–307. ———
L'Archipel du Tonkin. *With Illustrations.*

French Indo-China. *Globus* **74** (1898): 142–147. ———
Ein Besuch in Pnom-Penh (Kambodscha). *With Illustrations.*

India. *Engineering Mag.* **15** (1898): 797–810. **King and Hughes.**
The Gold Resources of India. By William King and Theo. W. Hughes Hughes.

India—Assam. ———
Agricultural Department, Assam. Bulletin No. 5, Agricultural Series No. 3. The Staple Crops of the Khasi and Jaintia Hills. Shillong, 1898. Size 10 × 6, pp. 20.

India—Tirah. *J. United Service I. India* **27** (1898): 227–262. **Hutchinson.**
The Story of Tirah, and the Lessons of the Campaign. By Colonel H. D. Hutchinson. *With Map.*

India—Tirah. **Hutchinson.**

The campaign in Tirah, 1897–98. An account of the Expedition against the Orakzais and Afridis under General Sir William Lockhart, G.C.B., K.C.S.I., based (by permission) on letters contributed to the *Times*. By Colonel H. D. Hutchinson. London: Macmillan & Co., 1898. Size 9½ × 6, pp. xvi. and 250. *Map, Plans, and Illustrations. Price* 8*s*. 6*d*. *Presented by the Publishers.*

This thrilling description of the Tirah campaign is naturally devoted mainly to the history of the military operations; but in such a country these are in very large measure dependent on the configuration, the essential details of which are made clear by a series of serviceable maps.

Japan. **Lay.**

Foreign Trade of Japan for the year 1897. Foreign Office, Annual No. 2109, 1898. Size 10 × 6½, pp. 28. *Price* 2*d*.

Japan—Yokohama. **Forster.**

Trade of Yokohama for the year 1897. Foreign Office, Annual No. 2165, 1898. Size 10½ × 6½, pp. 20. *Price* 1½*d*.

Malay Archipelago—Borneo. *J. Manchester G.S.* **13**, 1897 (1898): 165–180. **Wardrop.**

All about North Borneo, the New Ceylon. By Mr. A. Tucker Wardrop. *With Map and Illustrations.*

An elementary sketch of some facts concerning North Borneo.

Malay Archipelago—Borneo. **Van der Willigen.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **15** (1898): 365–443.

Mededeelingen omtrent een reis door Borneo, van Pontianak naar Bandjermasin, langs Melawi en Kahajan, in 1894 gemaakt door P. C. van der Willigen. *With Map.*

Describes a journey in Dutch Borneo, the map showing the location of the Serah and the Mardahika Dayaks.

Malay Archipelago—Java. *B.S.G. Lille* **29** (1898): 317–346, 369–399. **Gallois.**

Une visite à l'île de Java hiver 1896-97. Par Eugène Gallois. *With Map and Illustrations.*

An account of the "sights" of Java, published in the hope of inducing other tourists to test the author's descriptions on the spot.

Malay Peninsula. **Rathborne.**

Camping and Tramping in Malaya. Fifteen Years' Pioneering in the Native States of the Malay Peninsula. By Ambrose B. Rathborne. London: Sonnenschein & Co., 1898. Size 9 × 6, pp. x. and 340. *Map and Illustrations. Price* 10*s*. 6*d*. *Presented by the Publishers.*

The author writes from many years' experience as a pioneer in the native states of the west of the Malay peninsula. He describes the tangled forests with their flora and fauna, discusses the resources of the region, and shows the extent to which they have been utilized, and gives interesting particulars as to the life of the natives and of the Chinese who take a leading part in the work of the settlements.

Persia. *Iz. Imp. Russ. G.S.* **34** (1898): 209–216. **Zarudnyi.**

Remarks on a journey to Persia in 1896. By N. Zarudnyi. [In Russian.]

Persia—Resht. **Churchill.**

Trade of Resht for the year 1897. Foreign Office, Annual No. 2128, 1898. Size 10 × 6½, pp. 12. *Map. Price* 4*d*.

Persia—Tehran. *Travel* **3** (1898): 140–145. **Ashley.**

Through Persia and Lower Caucasia. By Ellis Ashley. II. Tehran. *With Illustrations.*

Persian Gulf. *Globus* **73** (1898): 392–395. **Seidlitz.**

Dr. S. Marks Reisen am Persischen Meerbusen. Von N. v. Seidlitz.

From the Russian description of a journey in Persia in 1897.

Rodrigues. **Colin.**

Rodrigues. Annual Report for 1896. Colonial Reports, Annual No. 223, 1897. Size 10 × 6½, pp. 10. *Price* 1*d*.

Russia—Batum. **Stevens.**

Trade of Batoum and District for the year 1897. Foreign Office, Annual No. 2067, 1898. Size 10 × 6½, pp. 28. *Price* 2*d*.

Russia—Caucasus. *Mém. S.G. Genève* **37** (1898): 25–44. **Dingelstedt.**
Les cours d'eau du Caucase et leur action géologique. Par M. V. Dingelstedt.

Russia—Caucasus. *Vierteljahrsb. Naturforsch. Ges. Zürich* **43** (1898): 25–45. **Heim.**
Geologische Nachlese. Von Albert Heim. Nr. 9. Querprofil durch den Central-Kaukasus, längs der grusinischen Heerstrasse, verglichen mit den Alpen. *With Plate.*

Russia—Caucasus. *G.Z.* **4** (1898): 320–335. **Schmidt.**
Ein Besuch in der Petrolstadt Baku. (Nach einem Vortrag.) Von Dr. Carl Schmidt. *With Plates.*

Russia—Central Asia. *Verh. Ges. Erdk. Berlin* **25** (1898): 262–265. **Futterer.**
Herr Dr. K. Futterer: Geologische Beobachtungen am Terek-Pass.

Russia—Siberia. **Saint-Yves.**
Rev. Française **23** (1898): 329–338, 390–400, 467-480, 517–529.
D'Omsk à Vierniy. Par Georges Saint-Yves.

Russia—Siberia. *Rev. G.* **42** (1898): 417–433; **43** (1898): 13–29, 81–98. **Baye.**
De Penza à Minoussinsk, souvenirs d'une mission. Par le Baron de Baye. *With Illustrations.*

Turkey. **Longworth.**
Trade of the Trebizond and Sivas Vilayets for the year 1897. Foreign Office, Annual No. 2069, 1898. Size 10 × 6, pp. 20. *Price* 1½*d.*

Turkey—Anatolia. **Gilbertson.**
Report on the Vilayet of Broussa. Foreign Office, No. 460, Miscellaneous, 1898. Size 10 × 6½, pp. 20. *Price* 1½*d.*

Turkey—Angora. **Shipley.**
Trade of Angora and District for the year 1897. Foreign Office, Annual No. 2166. Size 10 × 6, pp. 12. *Price* 1*d.*

Turkey—Erzerum. **Graves.**
Trade of Erzeroum and District for the year 1897. Foreign Office, Annual No. 2163, 1898. Size 10 × 6, pp. 16. *Price* 1*d.*

Turkey—Syria. *Oester. Monats. Orient* **24** (1898): 75-82. **Feigl.**
Altsyrische Baukunst. Von Hermann Feigl.

On the excavations in Senjirli-Yadai, situated between Alexandretta and Marash.

Turkey—Syria. *Palestine Exploration Fund, Q. Statement* (1898): 183-205. **Glaisher.**
On the Temperature of the Air at Jerusalem, from continuous observations, 1882 to 1896, and comparison with the temperature of the air at Sarona, from simultaneous observations, 1882 to 1889. By James Glaisher, F.R.S.

Turkey—Syria. *Palestine Exploration Fund, Q. Statement* (1898): 145–154. **Schick.**
The Site of the Church of the Holy Sepulchre at Jerusalem. By Dr. Conrad Schick. *With Plan and Sections.*

AFRICA.

Abyssinia. *A travers le Monde, Tour du Monde* **4** (1898): 281–284. **Leymarie.**
Impressions d'Abyssinie. Par M. Henri Leymarie. *With Illustrations.*

Algeria. *B.S. Languedoc. G.* **21** (1898): 195–216. **Mercier.**
Vingt-huit jours chez les Tirailleurs algériens. Par M. Gaston Mercier.

On military life in the south of Algeria.

Algeria. *XVI. Jahresb. G. Ges. Bern*, 1897 (1898): 71–132. **Stockmar.**
L'Algérie en 1840. Lettres de X. Stockmar.

Algeria—Jijelli. *Rev. Maritime* **137** (1898): 464–492; **138** (1898): 41–71. **Monchicourt.**
L'expédition de Djidjelli (1664). Par M. Ch. Monchicourt. *With Maps.*

A detailed account of the French military expedition to Algeria in 1664, the occupation of the seaport of Jijelli, and the subsequent withdrawal.

British Central Africa. *P. Philosoph. S. Glasgow* **29** (1898): 97–122. **Macrone.**
Railway Survey Work in the Shiré Highlands of British Central Africa, with General Observations on the Country between Chinde and Lake Nyasa. By Grieve Macrone.

British Central Africa. **Weatherley.**

Circumnavigation of Lake Bangweolo. By Paulett Weatherley. (From the *Geographical Journal* for September, 1898.) Size 10 × 6½, pp. 22. *Map and Illustrations.*

British East Africa—Uganda. **Berkeley.**

Africa. No. 10 (1898). Report by Her Majesty's Commissioner in Uganda on the Recent Mutiny of the Soudanese Troops in the Protectorate. London: Eyre & Spottiswoode, 1898. Size 13½ × 8½, pp. 20. *Map. Price 7d.*

British East Africa—Zanzibar. *Globus* **74** (1898): 169–173. **Werth.**

Tumbatu, die Insel der Watumbatu. Von E. Werth. *With Map and Illustrations.*

British South-West Africa. *Globus* **74** (1898): 105–110. **Passarge.**

Ein Ausflug zu den Südwestafrikanischen Guanoinseln. Von Anton Passarge.

Describes a visit in 1897 to Possession island, Halifax island, the islands of Angra Pequena, and Lüderitz bays, Ichaboe island, Mercury island, and Hollam's Bird island, of each of which a short account is given.

British West Africa—Benin. *J. Manchester G.S.* **14** (1898): 208–221. **Roth.**

A Diary of a Surgeon with the Benin Punitive Expedition. By Felix N. Roth.

Congo Railway. *B.S.R. Belge G.* **22** (1898): 305–313. ———

Le Chemin de fer du Congo.

Congo Railway. *Tour du Monde* **4** (1898): 493–504. **Lorin.**

Le Chemin de fer du Congo. Par M. Henri Lorin. *With Map and Illustrations.*

Congo Railway. *Rev. Française* **23** (1898): 583–591. **Montell.**

Le Chemin de fer du Bas-Congo. Par A. Montell. *With Maps and Illustration.*

Congo State. *Fortnightly Rev.* **64** (1898): 565–574. **Boulger.**

Twelve Years' Work on the Congo. By Demetrius C. Boulger.

A sketch of the history of the Congo Free State.

Congo State. *B.S.R.G. d'Anvers* **22** (1898): 89–110. **Dubreucq.**

Les opérations Chaltin, dans le Haut-Uellé. Par le Lieutenant R. Dubreucq.

Congo State. *B.S.R. Belge G.* **22** (1898): 245–280. **Navez.**

La reprise du Congo. Par Louis Navez.

On the origin of the Congo Free State, and the international arrangements which helped its formation.

East Africa. *M. k.k. G. Ges. Wien* **41** (1898): 449–476. **Schoeller.**

Ergebnisse meiner Expedition nach Aequatorial-Ost-Afrika und Uganda 1896–97. Von Dr. Max Schoeller.

A journey in 1896–97 from Pangani to Victoria Nyanza and Uganda, returning to Mombasa. This journey is also described in the *Deutsche Kolonialzeitung* 15 (1898): 59–63, 206–207, 232–234.

Egypt—Libyan Desert. **White.**

From Sphinx to Oracle. Through the Libyan Desert to the Oasis of Jupiter Ammon. By Arthur Silva White. London: Hurst & Blackett, [1898.] Size 9 × 6, pp. xvi. and 278. *Maps and Illustrations. Price 16s. Presented by the Publishers.*

A journey in the early part of 1898 by camel across the Libyan desert from Cairo to Siwa.

Egypt—Sinai. *B.S. Khédiv. G.* **5** (1898): 5–35. **Fourtau.**

La côte ouest du Sinaï. Par M. R. Fourtau. *With Map.*

Egypt—Suez Canal. **Cameron.**

Trade of Port Said and Suez for the year 1897. Foreign Office, Annual No. 2170, 1898. Size 9½ × 6½, pp. 16. *Price 1½d.*

Egyptian Sudan. *Quarterly Rev.* **188** (1898): 546–572. ———

England and the Soudan.

Egyptian Sudan. *Contemporary Rev.* **74** (1898): 480–481. ———

General Gordon's Territories: a Facsimile of his Autograph Map. *With Map.*

Egyptian Sudan. *Contemporary Rev.* **74** (1898): 482–497. **Felkin.**

The Soudan Question. By R. W. Felkin. *With Map.*

Egyptian Sudan. **Alford and Swo**

The Egyptian Soudan, its Loss and Recovery, including I.—A rapid sketch of the History of the Soudan. II.—A narrative of the Dongola Expedition, 1896. III.—A full account of the Nile Expeditions, 1897–8. By Henry S. L. Alford and W. Dennistoun Sword. With numerous Portraits, Illustrations, and Maps, and Records of the services of the Officers (1896–8), etc. London: Macmillan & Co., 1898. Size 9½ × 6, pp. xiv. and 336. *Price* 10*s*. *Two copies—one presented by the Authors, the other by the Publishers.*

A history of the re-conquest of the Sudan, with a short account of the explorati and occupation by the Egyptian government, and its loss. Then in full detail t narrative follows step by step the incidents of the recapture, the Dongola expediti of 1896 from the personal experience of the authors, the operations of 1897 and th expedition of 1898, compiled from trustworthy unpublished sources. The whole illustrated with portraits, maps, and excellent diagrams of the chief battles.

Gold Coast. **Kem**

Nine Years at the Gold Coast. By the Rev. Dennis Kemp. London: Macmillan & Co., 1898. Size 9½ × 6, pp. xvi. and 280. *Map and Illustrations. Price* 12*s*. 6*d*. *Presented by the Publishers.*

This is a description of life in the Gold Coast colony, written in a refreshingl healthy style. The author is a missionary, singularly free from prejudice of any kin and profoundly interested in his subject. In addition to descriptions of journeys in th "bush" of the colony proper, there is a pleasant account of a visit to Kumasi after th British force had taken possession of the Ashanti capital. The attitude of Mis Kingsley towards West African missionary work is discussed.

Lagos. **Ker**

Lagos. Annual Report for 1897. Colonial Reports, Annual No. 232, 1898. Size 10 × 6, pp. 10. *Price* 1d.

Madagascar. *C. Rd., S.G. Paris* (1898): 275–281. **Bastard**

Voyage chez les Sakalaves du sud-ouest et chez les Bares. Par M. Bastard. *With Map.*

This journey took place in the region on the south-west of Madagascar, betwee the rivers Mangoky and Onilaki.

Madagascar. **Driencourt, Rollet de l'Isle, and Laporte**

Ann. Hydrographiques (1897): 73–105.

Rapport sur les missions hydrographiques de Madagascar (1891–1895). Par MM. Driencourt, Rollet de l'Isle et Laporte. *With Maps and Plate.*

An account of the progress of the survey of the coast of Madagascar.

Madagascar. *B.S.G. Com. Bordeaux* **21** (1898): 177–200. **Fayet**

Madagascar. Le Bouéni (Majunga). Par A. Fayet.

Madagascar. *Ann. G.* **7** (1898): 375–377. **Gautier**

Hypsométrie de la partie septentrionale de Madagascar. Par M. Émile F. Gautier. *With Map.*

Madagascar. *B. et Mém. S. Africaine Française* (1898): 3–12. **Penant**

Rapport à la Commission d'initiative de la Société Africaine de France sur les conséquences du rattachement à Madagascar des anciennes colonies de Diégo-Suarez, Nossi-Bé et Sainte-Marie.

Madeira. **Spence.**

Trade of Madeira for the year 1897. Foreign Office, Annual No. 2089, 1898. Size 10 × 6½, pp. 10. *Price* 1*d*.

Portuguese East Africa—Chinde. **Greville.**

Trade of Chinde for the year 1897. Foreign Office, Annual No. 2106, 1898. Size 10 × 6½, pp. 12. *Map. Price* 2½*d*.

Portuguese East Africa—Lourenço Marques. **Parminter.**

Trade of Lourenço Marques for the year 1897. Foreign Office, Annual No. 2162, 1898. Size 10 × 6½, pp. 14. *Price* 1*d*.

Red Sea. *J.R. Asiatic S.* (1898): 617–618. **King.**

The Red Sea: Why so called. By Major J. S. King.

Suggests that Hamyar = Arabic *Ahmer* = red, the founder of the Himyaritic dynasty, gave name to the *Red* sea, along the borders of which his empire extended, and that the Greek derivation from "King Erythros" was merely a translation.

Royal Niger Company. **Baillaud.**
La Compagnie Royale du Niger et son évolution. Par Emile Baillaud. (Extrait, Annales de l'École Libre des Sciences Politiques. Treizième Année, No. 4, 15 Juillet 1898.) Size 10 × 6½, pp. 493–512. *Presented by the Author.*

This pamphlet is announced as an extract from a forthcoming work devoted to the study of the Royal Niger Company.

Sahara—In-Salah. *B. Comité l'Afrique Française* **8** (1898): 227–228. **Vuillot.**
A In-Salah. Par M. P. Vuillot. *With Map.*

Sierra Leone. **Elliott.**
Sierra Leone. Annual Report for 1897. Colonial Reports, Annual No. 234, 1898. Size 10 × 6½, pp. 24. *Price* 1½*d.*

Somaliland. **Vannutelli and Citerni.**
La seconda spedizione Bòttego nell' Africa orientale. Conferenza di L. Vannutelli e C. Citerni con una breve introduzione di G. Roncagli. (Estratto dalle Memorie della Società Geografica Italiana, vol. viii. p. ii., 1898.) Roma, 1898. Size 9½ × 6½, pp. 28. *Presented by Signor L. Vannutelli.*

South-East Africa. *Mém. S.G. Genève* **37** (1898): 15–23. **Grandjean.**
L'invasion des Zoulous dans le Sud-Est africain. Par M. Arthur Grandjean.

This short account of Zulu history is written by a missionary, but does not apparently refer to his personal observations.

Sudan. *Rev. Française* **23** (1898): 79–88. **Demanche.**
Les lettres de la Mission Marchand. Par G. Demanche. *With Map.*

Sudan. *Rev. Française* **23** (1898): 89–97. **Servigny.**
Le Bahr el Ghazal et ses habitants. Par J. Servigny.

Tripoli. **Dickson.**
Trade of Tripoli for the year 1897. Foreign Office, Annual No. 2048, 1898. Size 10 × 6½, pp. 10. *Price* 1*d.*

Tripoli. **Motta.**
Bollettino del Ministero degli Affari Esteri. Luglio, 1898. Turchia. La Tripolitania. Rapporto del cav. avv. Riccardo Motta. Roma, 1898. Size 9½ × 6½, pp. 64.

Tripoli. *Deutsche G. Blätter* **21** (1898): 88–110. **Grothe.**
Tripolitanien und der Karawanenhandel nach dem Sudan. Von Dr. L. H. Grothe.

Tunis. **Johnston.**
Report on the Regency of Tunis during the French Protectorate. Foreign Office, Miscellaneous, No. 447, 1898. Size 10 × 6, pp. 48. *Map. Price* 4½*d.*

Tunis. *Miss. Catholiques* **30** (1898): 316–318, 333–336. **Neu.**
Béja (Tunisie). Par M. Neu. *With Illustrations.*

West Africa—Benin Art. **Roth.**
Notes on Benin Art. By H. Ling Roth. Also Note on the finding of some of the Metal and other Art Work in Benin City. By Felix N. Roth. (Reprinted from the *Reliquary and Illustrated Archæologist*, July, 1898.) Size 10½ × 7½, pp. 14. *Illustrations. Presented by the Author.*

Mr. Ling Roth is not inclined to believe that the curious art work of Benin was of Portuguese introduction. He thinks it was of earlier origin, possibly coming from Egypt, although the Portuguese invasion undoubtedly influenced it.

West Africa—Niger. *B. Comité l'Afrique Française* **8** (1898): 207–218. ———
La convention du Niger. *With Map.*

West Africa—Niger. *Questions Dipl. et Colon.* **4** (1898): 273–280, 321–329. **Étienne.**
La convention franco-anglaise du Niger. Par M. Étienne. *With Maps.*

West Africa—Niger. *Deutsche Kolonialz.* **15** (1898): 227–230. **Vohsen.**
Das englisch-französische Abkommen in Westafrika vom 14 Juni 1898. Von E. Vohsen. *With Maps.*

West Africa—Niger. *B.S.G. Lille* **29** (1898): 109–141. **Voulet and Chanoine.**
Dans la Boucle du Niger. Par Capitaine Voulet et Lieut. Chanoine. *With Map and Plates.*

Western Sudan. *Nineteenth Century* **44** (1898): 79–91. **Robinson.**
Civilisation in the Western Soudan. By the Rev. Canon C. H. Robinson.

NORTH AMERICA.

American Race. **Wils**

The Antiquity of the Red Race in America. By Thomas Wilson.—Report of the U.S. National Museum for 1895. Washington, 1897. Pp. 1039–1045.

A chain of theoretical argument which culminates in the conclusion "that t migration by which the American race came to occupy the western hemisphere cou not have been less than two thousand years prior to the Christian era, but that, they came from other countries, they might have come a long time before."

Canada. **Tyrre**

Across the Sub-Arctics of Canada, a Journey of 3200 miles by canoe and snow-shoe through the Barren Lands. By J. W. Tyrrell. Including a List of Plants collected on the Expedition, a Vocabulary of Eskimo Words, a Route Map, and full classified Index. With Illustrations from Photographs taken on the journey, and from drawings by Arthur Heming. London: T. Fisher Unwin [*not dated*]. Size 9 × 6, pp. 280. *Price 7s. 6d.*

A journey in 1893 north-eastward along the Athabasca river and lakes to Cheste field inlet, returning along the west shore of Hudson bay.

Canada and Alaska. *B.S.G. Com. Paris* **20** (1898): 339–360, 514–529. **Serr**

Les terrains aurifères dans le Canada et l'Alaska. Par M. P. Serre. *With Maps.*

Canada—British Columbia. **Bos**

The Social Organization and the Secret Societies of the Kwakiutl Indians. By Franz Boas. Based on personal observations and on notes made by Mr. George Hunt.—Report of the U.S. National Museum for 1895. Washington, 1897. Pp. 311–738. *Illustrations.*

Canada—British Columbia. *Deutsche Rundschau G.* **21** (1898): 13–17. **Habe**

Das North-Forkthal in Britisch-Columbien. Von Jean Habel. *With Illustration.*

On the valley of the North Fork of the Wapta or Kicking Horse river.

Canada—Crofter Colonization. ——

Eighth Report of Her Majesty's Commissioners appointed to carry out a scheme of Colonization in the Dominion of Canada of Crofters and Cottars from the Western Highlands and Islands of Scotland; with Appendices. London: Eyre & Spottiswoode, 1897. Size 13½ × 8½, pp. 12. *Price 1½d.*

Canada—Labrador. **Low**

Report on a traverse of the Northern part of the Labrador Peninsula from Richmond Gulf to Ungava Bay. By A. P. Low.—Geological Survey of Canada. Part L. Annual Report, vol. ix. Ottawa, 1898. Size 10 × 7, pp. 44. *Illustrations.*

The official account of Mr. Low's important journey in northern Labrador.

Canada—New Brunswick. **Kai**

List of recorded Earthquakes in New Brunswick. Compiled from Published Works and from Private Information. By Samuel W. Kain. Reprinted from Bulletin xvi. of the Natural History Society of New Brunswick. St. John, N.B., 1898. Size 9 × 6, pp. [8.] *Presented by the Author.*

Canada—N.W.T. *Church Miss. Intelligencer* **49** (1898): 656–662. **Stringer, etc**

Within the Arctic Circle. Letters from the Bishop of Mackenzie river and the Rev. I. O. Stringer.

Canada—Nova Scotia. **Bailey**

Report on the Geology of South-West Nova Scotia, embracing the counties of Queens, Shelburne, Yarmouth, Digby, and part of Annapolis. By L. W. Bailey, PH.D.—Geological Survey of Canada. Part M. Annual Report, vol. ix. Ottawa, 1898. Size 10 × 7, pp. 154. *Map.*

Canada—Ontario. **Bel**

Report on the Geology of the French River Sheet, Ontario. By Robert Bell, M.D. —Geological Survey of Canada. Part I. Annual Report, vol. ix. Ottawa, 1898. Size 10 × 7, pp. 30. *Map.*

CENTRAL AND SOUTH AMERICA.

Argentine Republic. **Churc**

Argentine Geography and the Ancient Pampean Sea. By Colonel George Earl Church. From the *Geographical Journal* for October, 1898. Size 10 × 6½, pp. 16. *Maps and Sections.*

Argentine Republic. **Laing.**

Trade of the Argentine Republic for the year 1897. Foreign Office, Annual No. 2044, 1898. Size 10 × 6½, pp. 20. *Price 1½d.*

Bolivia. **Ballivian and Zarco.**

Monografías de la Industria Minera. I. El Oro en Bolivia. Por Manuel V. Ballivián y José Zarco. La Paz, 1898. Size 8½ × 5½, pp. 248. *Map. Presented by M. V. Ballivian.*

On the gold resources of Bolivia.

Bolivia. **Ballivian and Saavedra.**

Oficina Nacional de Inmigración, Estadistica y Propaganda Geográfica. Monografias de la Industria Minera. II. El Cobre en Bolivia. Por Manuel V. Ballivian y Bautista Saavedra. La Paz, 1898. Size 8½ × 6, pp. 68. *Map. Presented by the Authors.*

On the resources in copper of Bolivia.

Bolivia. **Cisneros and Garcia.**

Geografia Comercial de la América del Sur. Por Carlos B. Cisneros y Romulo E. Garcia. Tercera Entrega. República de Bolivia. Lima: Imprenta y Libreria de San Pedro, 1897. Size 8½ × 6, pp. 101–232.

Brazil. **Bernal.**

Trade of Rio Grande do Sul and of Porto Alegre for the year 1897. Foreign Office, Annual No. 2080, 1898. Size 10 × 6½, pp. 34. *Price 5d.*

Brazil and French Guiana. *Globus* 74 (1898): 147–150. **Katzer.**

Der streitige Golddistrikt von Brasilianisch-Guyana. Von Dr. F. Katzer.

British Guiana. ——

British Guiana. Report of the Council of the Institute of Mines and Forests, on the Gold and Forest Industries of British Guiana, for the year ending 30th June, 1898. Georgetown, Demerara; Printed by Baldwin & Co., 1898. Size 13½ × 8½, pp. 24.

British Guiana. **Cox.**

British Guiana. Annual Report for 1896–7. Colonial Reports, Annual No. 222, 1897. Size 10 × 6½, pp. 24. *Price 1½d.*

British Guiana and Venezuela. **Phillips.**

Guiana and Venezuela Cartography. By P. Lee Phillips. (From the Annual Report of the American Historical Association for 1897, pp. 681–776.) Washington, 1898. Size 9½ × 6. *Presented by the Author.*

A list of the maps showing the Venezuela and British Guiana boundary.

Central America. **Trayner.**

Report on the Legal Status of Foreign Residents in Central America. Foreign Office, Miscellaneous, No. 476, 1898. Size 10 × 6½, pp. 36. *Price 2½d.*

This is an important report dealing with the laws affecting foreigners in the Central American Republics, and giving extracts from the constitutions of the republics. The naturalisation laws in particular deserve notice, on account of the number of ways in which a foreigner may become automatically naturalized, perhaps without his own knowledge.

Chile. *Verh. Ges. Erdk. Berlin* 25 (1898): 324–328. **Krüger.**

Herr Dr. Paul Krüger: Ueber die Erforschung des Rio Corcovado.

Chile—Andes. **Philippi.**

Sobre el verdadero significado de la palabra Cordillera. Por Dr. R. A. Philippi. Santiago de Chile, 1898. Size 7 × 5, pp. 10.

Chile—Boundary Question. ——

The Chilian Boundary Question. Three maps showing: 1. Extent of the Surveys made by the Chilian and the Argentine Demarcation Commissions from 1892–1896; 2. The Surveys effected from 1892 up to date by the Chilian Demarcation Commissions; 3. The Surveys effected from 1892 up to date by the Argentine Demarcation Commissions. (From the *Standard*, Buenos Aires, July 11, 1898.)

Chile—Juan Fernandez. *Globus* 74 (1898): 235–238. **Polakowsky.**

Neues von der Robinson-Insel. Von Dr. H. Polakowsky. *With Illustrations.*

Colombia—Panama. **Mallet**

Trade of Panama and District for the year 1897. Foreign Office, Annual No. 2088, 1898. Size 10 × 6½, pp. 26. *Price 2d.*

Cuba. **Rowan and Ramsey**

The Island of Cuba; a descriptive and historical account of the "Great Antilla." By Andrew Summers Rowan and Marathon Montrose Ramsey. London: Gay & Bird, 1898. Size 7 × 5, pp. x. and 280. *Maps. Price 6s.*

A description of Cuba written in 1896.

AUSTRALASIA AND PACIFIC ISLANDS.

British New Guinea. **Macgregor**

Annual Report on British New Guinea, from July 1, 1896, to June 30, 1897. With Appendices. Brisbane, 1898. Size 13½ × 8½, pp. xxvi. and 96. *Maps and Illustrations.* British New Guinea. Annual Report for 1896-97, Colonial Reports, Annual No. 237, 1898. Size 10 × 6½, pp. 48. *Price 2½d.*

The individual reports here collected have been referred to in the *Journal* from time to time as they appeared.

Ladrone Islands. *B.S.G. Com. Havre* **15** (1898): 49-61, 65-96. **Marche.**

Note de voyage sur les îles Mariannes. Par M. Alfred Marche.

New Hebrides. *Deutsche G. Blätter* **21** (1898): 110-112. **Greffrath.**

Die Neu-Hebriden. Von H. Greffrath.

New Zealand. *T. and P. New Zealand I.* **30**, 1897 (1898): 33-41. **Best.**

Tuhoe Land: Notes on the Origin, History, Customs, and Traditions of the Tuhoe or Urewera Tribe. By Elsdon Best.

New Zealand. **Smith.**

Report of the Department of Lands and Survey, New Zealand, for the year 1897-98. By Stephenson Percy Smith, Surveyor-General. Wellington, 1898. Size 13½ × 8½, pp. xxii. and 252. *Maps and Plates.*

This report is illustrated by numerous photographs, plans, and maps, showing the progress of the survey of New Zealand, the public works, and the transactions in land.

New Zealand—Hawke's Bay. *T. and P. New Zealand I.* **30**, 1897 (1898): 515-531. **Hill.**

On the Hawke's Bay Plain: Past and Present. By H. Hill.

A sketch of the geological evolution of Hawke's bay, and details of the configuration of the plain which surrounds it, with special regard to the floods following severe storms, and suggestions as to the preservation of the district from their effects.

Pacific Islands. *Ann. Hydrographiques* (1897): 59-61. ——

Déterminations des positions géographiques dans les possessions Allemandes de l'océan Pacifique.

An account of the methods and statement of the results of longitude determinations by Dr. Hayn, of Leipzig, in 1895, in the German Pacific Possessions.

Pleasant Island. *Globus* **74** (1898): 153-158. **Krämer.**

Nauru: Ein Besuch der Insel. Von Dr. Augustin Krämer. *With Illustrations.*

Nauru, or Pleasant island, lies in 0° 27′ S. and 167° E., far from any other islands. Photographs show views of the cliff of upraised reef which surrounds the island, and of the people.

Queensland. *P.R.S. Queensland* **13** (1898): 39-50. **Roth.**

Notes on Social and Individual Nomenclature among certain North Queensland Aboriginals. By Walter E. Roth.

Queensland—Almanac and Directory. **Pugh.**

Pugh's Almanac and Queensland Directory for 1898. Brisbane: Gordon & Gotch, 1898. Size 7½ × 5, pp. 594 and 520. *Map, Plan, and Illustrations. Presented by the Queensland Government.*

This is at once an almanac and gazetteer, supplying the fullest information on all matters regarding Queensland.

Rotuma. *J. Anthrop. I.* **27** (1898): 396-435, 457-524. **Gardiner.**

The Natives of Rotuma. By J. Stanley Gardiner, B.A. *With Illustrations.*

Tasmania. ——

Tasmania and its Mineral Wealth. Issued as a Special Edition of the Australian Mining Standard, July 1, 1898. Melbourne and Sydney. Size 15 × 10, pp. 92. *Illustrations. Price* 1*s. Presented by J. Easton, Esq.*

Tonga. **Leefe.**

Trade of Tonga for the year 1897. Foreign Office, Annual No. 2174, 1898. Size 10 × 6½, pp. 8. *Price* ½*d.*

West Australia. *Ann. Hydrographie* **26** (1898): 256–258. ——

Der Hafen von Fremantle in Westaustralien. *With Plan.*

Western Australia. ——

Western Australia. Department of Mines. Gold Mining Statistics, 1897. Size 13 × 8½, pp. 124.

Western Australia. **Hope.**

Western Australia: the South-Western Districts. Written by Geo. Hope. Supplement to the *Geraldton Express.* Size 17½ × 11½, pp. 72. *Illustrations.*

These supplements give an excellent account of the present condition and industries of Western Australia, especially of the timber trade.

Western Australia. **Maitland.**

Western Australia. Geological Survey. Bulletin No. 1. Bibliography of the Geology of Western Australia. By A. Gibb Maitland. Perth, 1898. Size 8½ × 5½, pp. 32. *Presented by the Government Geologist.*

Western Australia. ——

Western Australia. Department of Lands and Surveys. Report by the Surveyor-General for the year 1897. Perth, 1898. Size 13½ × 8½, pp. 46. *Maps. Presented by the Surveyor-General, W. Australia.*

Western Australia—Abrolhas Island. **Helms.**

Houtman's Abrolhas. By R. Helms. (From the *Producers' Gazette, and Settlers' Record,* Western Australia, vol. v. part 6, June, 1898, pp. 409–431.) *Map and Illustrations.* Perth, 1898. Size 10 × 6½.

POLAR REGIONS.

Antarctic. **Fricker.**

Antarktis. Von Dr. Karl Fricker.—Bibliothek der Länderkunde, herausgegeben von Alfred Kirchhoff und Rudolf Fitzner. Band i. Berlin: Schall & Grund, 1898. Size 10½ × 7, pp. vi. and 230. *Maps and Illustrations. Two copies—one presented by the Author, the other by the Publishers.*

An account of the history of antarctic exploration, with very attractive illustrations, followed by a summary of all that is known of the antarctic regions.

Arctic—Spitsbergen. **Conway.**

An Exploration in 1897 of some of the Glaciers of Spitsbergen. By Sir W. Martin Conway. (From the *Geographical Journal* for August, 1898.) Size 10½ × 6½, pp. 22. *Map and Illustrations.*

Eskimo Art. **Hoffman.**

The Graphic Art of the Eskimos. Based upon the Collections in the National Museum. By Walter James Hoffman, M.D.—Report of the U.S. National Museum for 1895. Washington, 1897. Pp. 739–968. *Map and Illustrations.*

Greenland. **Peary.**

Northward over the "Great Ice." A Narrative of Life and Work along the Shores and upon the Interior Ice-cap of Northern Greenland in the years 1886 and 1891–1897: with a description of the little tribe of Smith-Sound Eskimos, the most northerly human beings in the World, and an account of the Discovery and bringing home of the "Saviksue," or great Cape-York Meteorites. By Robert E. Peary. 2 vols. London: Methuen & Co., 1898. Size 9½ × 7, pp. (vol. i.) lxxx. and 522; (vol. ii.) xiv. and 626. *Portraits, Maps, and Illustrations. Price* 32*s. Presented by the Publishers.*

This important work is noticed in the *Journal* for November, p. 498.

MATHEMATICAL GEOGRAPHY.

Cartography—Projections. *Ann. Hydrographie* **26** (1898): 359–362. **Matthieu.**

Eine neue Anwendung der orthographischen Aequatorialprojektion in der Nautik. Von P. Matthieu. *With Illustration.*

Marine Surveying. *B.S.G. de l'Est* (1898): 90–112. **Thoulet.**
Comment se fait une carte marine (Promenades sur terre et sur mer en Bretagne). Par M. J. Thoulet. *With Illustrations.*

A very popular description of the preparation of a marine chart, interspersed with the record of a trip along the coast of Brittany.

Time-reckoning. *Rev. Scientifique* 10 (1898): 457–461. **Sarrauton.**
L'heure décimale et la date universelle. Par M. H. de Sarrauton.

Time Standard. *J. Manchester G.S.* 14 (1898): 24–35. **Greenwood.**
Unification of Time at Sea. By Captain W. Nelson Greenwood. *With Illustration.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geomorphology. *Sitz. k. A.W. Wien* 107, Abth. I. (1898): 89–102. **Suess.**
Ueber die Asymmetrie der nördlichen Halbkugel. Von E. Suess.

Glaciers. **Richter.**
Commission Internationale des Glaciers. Les variations périodiques des Glaciers. Troisième Rapport 1897, rédigé par E. Richter. Extrait des *Archives des Sciences physiques et naturelles*, t. vi., 1898. Genève: Georg & Cie., 1898. Size 9½ × 6½, pp. 51–84.

Loess. *American J. Sci.* 6 (1898): 299–304. **Keyes.**
Eolian Origin of Loess. By Chas. R. Keyes.

Putting forward arguments for the possible formation by wind of the loess of the Mississippi valley, the origin of which is usually assigned to the action of water by American geologists.

Meteorology. *C. Rd.* 127 (1898): 251–253. **Poincaré.**
Sur le tourbillon polaire. Note de M. A. Poincaré.

This paper claims a large share for lunar attraction in influencing the circulation of the atmosphere, and consequently the climate near the poles.

Meteorology. *Quarterly J.R. Meteorolog. S.* 24 (1898): 180–206. **Rawson.**
Anticyclonic Systems and their Movements. By Major Herbert E. Rawson. *With Diagrams.*

This paper refers to the areas of high atmospheric pressure over the globe, and to the smaller anticyclones of a more temporary kind.

Meteorology. *Meteorolog. Z.* 15 (1898): 249–261. **Trabert.**
Die Temperaturabnahme mit der Höhe in den niederösterreichischen Kalkalpen. Von Dr. Wilhelm Trabert.

An exhaustive comparison of long-period temperature means to bring out the average change of temperature with height for each month of the year for the lee and weather sides of the mountains.

Meteorology—Atmospheric Circulation. **Schaw.**
T. and P. New Zealand I. 30, 1897 (1898): 465–476.
Notes on the Vertical Component of the Motions of the Earth's Atmosphere. By Major-General Schaw, C.B.

An important paper pointing out the importance of studying the vertical component of atmospheric movement in the winds of ordinary cyclonic and anticyclonic systems, and advocating the use of balanced wind-vanes capable of setting themselves to the true direction of the wind, and not confined to movement in a horizontal plane.

Meteorology—Dust. *Ann. Hydrographie* 26 (1898): 246–254. ———
Bericht über auf dem Meere beobachtete Staubfälle.

Reports of a number of cases of dust-falls being observed at sea on German ships.

Meteorology—Maps. *Rev. Scientifique* 10 (1898): 321–325. **De Saussure.**
Les cartes météorologiques. Par M. René de Saussure. *With Illustrations.*

This paper illustrates a method of representing on maps the lines of atmospheric movement over a whole country, in place of merely placing arrows here and there to show the direction of the wind. A specimen map is given.

Meteorology—Ocean Rainfall. *J. Manchester G.S.* 14 (1898): 36–56. **Black.**
Ocean Rainfall by Rain-Gauge Observations at Sea—1864–75–81. General and Special Oceans. By W. G. Black. *With Chart.*

This elaborate paper contains a series of tables giving estimates of the annual rainfall and number of rainy days in various zones of each ocean, with a chart showing the zones adopted.

Meteorology—Pressure. *Sitzb. k. A.W. Wien* **107**, Abth. IIa. (1898): 63–159. **Hann.**
Weitere Beiträge zu den Grundlagen für eine Theorie der täglichen Oscillation des Barometers. Von J. Hann.

The discussion of a great mass of observations of the diurnal range of the barometer, leading to a revision of the formula for representing the diminution with increasing latitude of the amplitude of the semidiurnal barometric wave.

Meteorology—Pressure. **Hann.**
Weitere Beiträge zu den Grundlagen für eine Theorie der täglichen Oscillation des Barometers. Von J. Hann. (Aus den Sitzungsberichten der kaiserl. Akademie der Wissenschaften in Wien. Mathem.-naturw.-Classe; Bd. cvii. Abth. ii. a. Jänner 1898.) Wien, 1898. Size 10 × 6½, pp. 98.

Meteorology—Typhoons. *Meteorolog. Z.* **15** (1898): 332–341. **Doberck and Bergholz.**
Die Taifune in den ostasiatischen Gewässern nach Doberck: The Laws of Storms (Hongkong 1898). Uebersetzt und redigirt von Dr. Paul Bergholz.

Ocean Depths. ——
List of Oceanic Depths and Serial Temperature Observations received at the Admiralty during the year 1897, from H.M. Surveying ships, Indian Marine Survey, and British Submarine Telegraph Companies. Hydrographic Department, Admiralty, London, February, 1898. London: J. D. Potter, 1898. Size 13½ × 8½, pp. 60. *Price* 5*s.* 6*d.*

Oceanography. *Scottish G. Mag.* **14** (1898): 416–425, 465–479. ——
Recent Hydrographic Research in the North and Baltic Seas.

Oceanography. *Nature* **58** (1898): 200–204. **Monaco.**
Some Results of my Researches on Oceanography. By Albert, Prince of Monaco. *With Illustrations.*

Oceanography. **Wandel and Ostenfeld.**
Iagttagelser over Oberfladevandets Temperatur, Saltholdighed og Plankton paa islandske og grønlandske Skibsrouter i 1897. Af C. F. Wandel og C. Ostenfeld, Kjøbenhavn, 1898. Size 9 × 6, pp. 50. *Charts.*

A useful contribution to practical oceanography, being a record of observations of temperature, salinity, and plankton of the surface waters between the Shetland Islands and Iceland or Greenland, made on board the Danish steamers during 1897. The work was in connection with Professor Pettersson's scheme for international research.

Oceanography—Tide. *C. Rd.* **126** (1898): 1613–1615. **Partiot.**
De la propagation et de la déformation de l'onde-marée qui remonte dans les fleuves. Mémoire de M. Partiot.

Rivers. *Rev. G. Italiana* **5** (1898): 201–205. **Bertolini.**
Ancora della Linea e dei fiumi di Resorgiva del Prof. G. L. Bertolini.

Specific Heat of Rocks. *Atti R.A. Lincei, Rendiconti* **7** (1898): 61–68. **Morano.**
La conduttività termica nelle rocce della campagna romana. Misura dei calori specifici e delle densità. Nota del dott. Francesco Morano.

The determination of the specific heat of rocks is of much importance with regard to the range of atmospheric temperature.

Speleology. *Rev. Scientifique* **9** (1898): 682–690. **Martel.**
La Spéléologie. Par M. E. A. Martel. *With Illustrations.*

Terrestrial Magnetism. *Ann. Hydrographie* **26** (1898): 267–270. **Nippoldt.**
Neue allgemeine Erscheinungen in der täglichen Variation der erdmagnetischen Elemente. Von A. Nippoldt jun. *With Diagram.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography. *Nineteenth Century* **44** (1898): 718–723. **Hurd.**
Coal, Trade, and the Empire. By Archibald S. Hurd.

On coaling-stations and their importance in maintaining ocean routes.

Commercial Geography—Indiarubber. *Kew B.* (1898): 241–277. ——
Para Rubber. *With Diagram and Illustrations.*

Historical—Dacia. *Archæologiai Értesitő* 17 (1897): 391-394. **Ornstein.**

Une route inconnue en Dacie du géographe de Ravenna. Par J. Ornstein. [In Hungarian.]

Historical—Travel. *B.S.G. Română* 19 (1898): 134-159. **Lahovari.**

Călĕtoria unuĭ boier Rumân în Europa la anul 1770. De Grigore Joan Lahovari.

On the travels in Europe of a Wallachian noble named Romani in 1770, the author of a book which was translated by J. F. Mayer, and published at Nuremberg in 1775.

Historical—Marco Polo. ———

The Story of Marco Polo. London: John Murray, 1898. Size 8½ × 6, pp. xiv. and 248. *Illustrations. Price* 6*s. Presented by the Publisher.*

The story of Marco Polo is told by means of a series of carefully selected extracts from Yule's 'Book of Ser Marco Polo,' connected into a continuous narrative and explained for the special benefit of young people by Mr. Noah Brooks.

Historical—Vasco da Gama. **Moreira de Sá.**

De Portugal á India. A Viagem de Vasco da Gama. Trechos que mais se prendem com o assumpto, tirados do poema de Luiz de Camões "Os Lusiadas" acompanhados de versões em Hespanhol, Italiano, Francez, Allemão e Inglez e colligidos por Ernesto Moreira de Sá. Lisboa, 1898. Size 10 × 7, pp. 494. *Map and Plates. Presented by the Author.*

This remarkable piece of work consists of a series of apposite quotations from the Lusiads in the original Portuguese, each stanza accompanied by translations in Spanish, Italian, French, German, and English. The revision of the proofs seems to have been most thorough, and we have not noticed a single misprint in the English section.

Historical—Vasco da Gama. *J.R. Asiatic S.* (1898): 589-604. **Reade.**

Vasco da Gama. By H. Reade.

Historical—Vasco da Gama. *Verh. Ges. Erdk. Berlin* 25 (1898): 215-243. ———

Fest-Sitzung zur Feier des siebzigjährigen Bestehens der Gesellschaft für Erdkunde zu Berlin am 25. Mai 1898, verbunden mit der vierhundertjährigen Gedenkfeier der Entdeckung des Seeweges nach Ost-Indien durch Vasco da Gama.

Historical—Vasco da Gama. **Hümmerich.**

Vasco da Gama und die Entdeckung des Seewegs nach Ostindien. Auf Grund neuer Quellenuntersuchungen dargestellt von Dr. Franz Hümmerich. München: O. Beck, 1898. Size 9½ × 6½, pp. xiv. and 204. *Portrait.*

History of Exploration. **Barth.**

Die von 1865-1895 erzielten Fortschritte der Kenntnis fremder Erdteile in ihren Einwirkungen auf das staatliche und wirtschaftliche Leben des Deutschen Reiches. Inaugural-Dissertation, der hohen philosophischen Fakultät der Universität Leipzig zur Erlangung der Doktorwürde vorgelegt von Christian G. Barth. Size 8 × 6, pp. xvi. and 184. *Presented by Prof. Ratzel.*

A summary of the exploring work of the last thirty years.

History—Tasman's Journal. **Heeres.**

Abel Janszoon Tasman's Journal of his Discovery of Van Diemens Land and New Zealand in 1642, with documents relating to his exploration of Australia in 1644, being Photo-Lithographic Facsimiles of the Original Manuscript in the Colonial Archives at the Hague, with an English Translation and Facsimiles of Original Maps, to which are added Life and Labours of Abel Janszoon Tasman, by J. E. Heeres, LL.D., Professor at the Dutch Colonial Institute, Delft, and observations made with the compass on Tasman's Voyage by Dr. W. Van Bemmelen, Assistant Director of the Royal Meteorological Institute, Utrecht. Amsterdam: F. Muller & Co., 1898. Size 18 × 12. *Price* £5 10*s.*

Political Geography. *Rev. G.* 43 (1898): 7-12. **Drapeyron.**

L'équilibre intercontinental. Les États-Unis et l'Espagne. Les puissances Coloniales. Par L. Drapeyron.

Political Geography. **Melville.**

Views of Commodore George W. Melville, Chief Engineer of the Navy, as to the Strategic and Commercial Value of the Nicaraguan Canal, the future control of the Pacific Ocean, the Strategic Value of Hawaii, and its Annexation to the United States. Washington, 1898. Size 9½ × 6, pp. 34. *Presented by the Author.*

Political Geography. *Z. Ges. Erdk. Berlin* 33 (1898): 126–140. **Schlüter.**

Die Grundgedanken aus Friedrich Ratzel's "Politischer Geographie." Von Dr. Otto Schlüter.

BIOGRAPHY.

Bertuch. *Deutsche Rundschau G.* 21 (1898): 38–42. **Wolkenhauer.**

Friedrich Justin Bertuch. Von W. Wolkenhauer. *With Portrait.*

Bertuch was born in 1747, in Weimar, and in 1798 commenced the publication of the first geographical journal under the title of *Allgemeinen Geographischen Ephemeriden.* He died in 1822.

Eden. **Steiner.**

Johns Hopkins University Studies in Historical and Political Science. Series XVI. Nos. 7–8–9. Life and Administration of Sir Robert Eden. By Bernard C. Steiner. Baltimore, 1898. Size 9½ × 6¼, pp. 142. *Portrait.*

Emin Pasha. **Schweitzer.**

Emin Pasha, his Life and Work. Compiled from his Journals, Letters, Scientific Notes, and from Official Documents by Georg Schweitzer, with an Introduction by R. W. Felkin, M.D. 2 vols. London: A. Constable & Co., 1898. Size 9 × 6, pp. (vol. i.) xliv. and 330; (vol. ii.) viii. and 340. *Map and Portrait. Price* 32*s*. *Presented by the Publishers.*

Gardner. *Imp. and Asiatic Quarterly Rev.* 6 (1898): 283–299. **Goldsmid.**

Alexander Gardner: Soldier and Traveller. By Major-General Sir Frederic I. Goldsmid, K.C.S.I., etc.

GENERAL.

Bern Geographical Society. *XVI. Jahresb. G. Ges. Bern,* 1897 (1898): 3–57. **Graf.**

Die geographische Gesellschaft in Bern, 1873–1898, Ein Rückblick gelegentlich der Feier des 25 jährigen Bestehens der Gesellschaft von Prof. Dr. J. H. Graf.

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Bulletin de la Société Languedocienne de Géographie. Deuxième Table Décennale (1888–1897), Tomes xi. à xx. Montpellier, 1898. Size 10 × 6½, pp. 14.

Bibliography. ———

Register zu den Bänden 101 bis 105 der Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Classe der kaiserlichen Akademie der Wissenschaften. XIV. Wien, 1897. Size 10 × 6½, pp. 144. *Presented by the Academy.*

An index in one alphabet to subjects and authors in the last five volumes of the reports of the mathematical and natural science section of the Vienna Academy.

Bibliography. **Bolton.**

A Catalogue of Scientific and Technical Periodicals, 1665–1895, together with Chronological Tables and a Library Check-List. By Henry Carrington Bolton. Second Edition, 1897.—Smithsonian Miscellaneous Collections. Vol. xl. Washington, 1898. Size 10 × 6½, pp. 1248.

This valuable catalogue, in addition to an alphabetical catalogue, gives a chronological table showing the dates of all the volumes of each periodical and the various series, an index of the subjects to which the periodicals refer, and an index of the libraries in the United States and Canada, where they are to be found.

Bibliography. *Rev. Scientifique* 10 (1898): 325–331. **Sauvage.**

Classification bibliographique décimale. Par M. Ed. Sauvage.

This scheme includes a specimen of a classification of geography.

Bibliography of Geography. ———

Bibliographie de 1897. 7ᵉ Bibliographie Annuelle.—Annales de Géographie. No. 35.—7ᵉ Année, 15 Septembre 1898. Paris: A. Colin & Cie. Size 10 × 6½, pp. 296.

The bibliography continues to give lists and brief abstracts of the chief geographical papers of the year, carefully selected and classified.

Church Missionary Society. ———

Proceedings of the Church Missionary Society for Africa and the East. Ninety-ninth year, 1897–98. London: Church Missionary House, 1898. Size 8½ × 6, pp. lxxx., 462, and 380. *Maps. Presented by the Church Missionary Society.*

Education—Methods. *B.S.R. Belge G.* **22** (1898): 281–294. ——
L'enseignement-supérieur de la Géographie en Belgique.

An article written with particular reference to the foundation of the Institute of Geography by Prof. Reclus, but also referring to the existing state of geographical teaching in Belgium.

Geography as a Science. *B.S. Topographie France* **22** (1898): 11–22. **Drapeyron.**
De la Coordination en géographie. Par M. Ludovic Drapeyron.

Geography as a Science. *B.S. Languedoc. G.* **21** (1898): 1–10. **Rouville.**
La géographie inspiratrice de théories géologiques, ou influence des milieux géographiques sur les conceptions scientifiques. (Extrait d'une allocution à la Société d'Études d'Histoire naturelle de Nimes.) Séance anniversaire du 11 décembre 1897. Par M. Paul de Rouville.

Health. **Harford-Battersby.**
Health in Africa. By Dr. C. F. Harford-Battersby. An Address given at the Annual Meeting of Livingstone College, November 25.

Language—Chi-nyanja. **Caldwell.**
Chi-nyanja Simplified. By R. Caldwell. Second Edition—with Key. London: the Zambesi Industrial Mission. Size 5½ × 4½, pp. 88 and 46. *Presented by the Author.*

This is a very clear lesson-book of what appears to be a remarkably simple language.

Library Conference. ——
Transactions and Proceedings of the Second International Library Conference, held in London, July 13–16, 1897. London : Printed for Members of the Conference, 1898. Size 12½ × 8½, pp. x. and 288.

Local Geography. *B.S. Topographie France* **22** (1898): 65–79. **Fauvel.**
Documents géographiques manuscrits (textes et cartes) existant dans les Bibliothèques publiques et les Archives des départements des communes ou des particuliers. Archives de l'Administration des contributions directes et du cadastre, des départements et des communes. Cadastres et documents annexés. Par M. E. Fauvel.

On the value of the geographical records preserved in the public archives of France.

Maps. ——
Catalogus der Land- en Zeekaarten toebehoorende aan het Koninklijk Instituut voor de Taal-, Land- en Volkenkunde van Nederlandsch- Indië. s-Gravenhage, M. Nijhoff, 1898. Size 10 × 6½, pp. 86.

Maps. **Phillips.**
The value of Maps in Boundary Disputes, especially in connection with Venezuela and British Guiana. By P. Lee Phillips. Size 9½ × 6, pp. [8]. *Presented by the Author.*

This paper is the result of the argument from ancient maps employed in the dispute between Venezuela and British Guiana. It lays stress on the small number of original maps in existence, and on the prevalence of unacknowledged copying.

Museums. **(Hoyle.)**
The Manchester Museum, Owens College. Report for the year 1897–98. Publication 23. Manchester: J. E. Cornish, 1898. Size 10 × 6½, pp. 64. *Price 6d. Presented by the Manchester Museum.*

This report contains an account of the principal museums in North America.

Pacific Cable. *Fortnightly Rev.* **64** (1898): 422–428. **Bright.**
An All-British, or Anglo-American, Pacific Cable. By Charles Bright. *With Map.*

The map shows the existing and projected submarine cables, and a number of the more important overland lines.

Royal Society—Record. ——
The Record of the Royal Society of London. 1897. London: Harrison & Sons, 1898. Size 8½ × 6, pp. vi. and 224. *Illustrations. Presented by the Royal Society.*

This is a record of the History of the Royal Society designed to relieve the Year-book of matter which does not require to be frequently altered.

Spanish Colonies. *G.Z.* **4** (1898): 425–431. **Zimmermann.**
Der Ausgang des spanischen Kolonialreichs. Von Dr. Zimmermann.

A sketch of the dwindling of the Spanish colonial empire.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications issued since October 8, 1898.

1-inch—General Maps:—

England and Wales (revision):—34, 173, 177, 193, 203, 210, 228, 251, 278, 294, 309, 310, 325, engraved in outline; 252, 282, 297, 300, 312, 328, 339, 350, hills engraved in black or brown. 1*s*. each. 264, hills engraved in black or brown (new series).

6-inch—County Maps:—

England and Wales (revision):—**Derbyshire**, 3 n.e., 6 s.e., 7 s.e. **Essex**, 3 n.w., 18 n.w., 30 s.w., 47 s.w., 81 n.e. **Hampshire**, 14 s.w., s.e., 22 n.w., 38 n.e., 47 n.e., 53 n.w., 55 s.e., 70 s.e., 72 s.w., 73 n.e., s.w., 74 s.e., 75 s.w., 79 n.w., 84 s.w. **Kent**, 1 s.e., 2 s.w., 4 s.w., 10 s.e., 11 s.e., 14 s.w., 15 n.w., 21 s.w., 22 n.w., s.e., 31 s.w., 34 n.e., 36 s.e., 64 n.e. **Northumberland**, 60 n.e., 62 n.e., 91 s.w., 106 n.e. **Sussex**, 49 n.w., 50 n.e. **Surrey**, 8 s.w.

25-inch—Parish Maps:—

England and Wales (revision):—**Berkshire**, XXIII. 2, 6. **Buckinghamshire**, XXXVIII. 6, 8; XXXIX. 2, 3, 4, 6, 7, 8, 9, 10, 11, 15; XLII. 3, 4, 6, 9, 10, 14, 15, 16; XLIII. 3, 4, 5, 6, 7, 8, 11, 12, 14, 16; XLV. 4, 8, 12, 16; XLVI. 6, 7, 10, 11, 12, 13, 15; XLVII. 3, 6, 7; LI. 1, 2, 3, 6. **Derbyshire**, I. 14, 15; II. 4, 8; III. 1, 5; V. 2, 6; XII. 1; XV. 13; XVIII. 13; XXI. 4; XXII. 1, 7, 8, 9, 10, 12; XXIV. 12; XXV. 1; XXVI. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13. **Hampshire**, LXXXIII. 3; LXXXVI. 5, 9, 10, 12, 13. **Cheshire**, III. 10; VIII. 8, 12; X. 7, 16; XI. 1, 4, 8, 11, 14; XVI. 6, 7, 8, 12, 13; XVII. 5, 6, 9; XVIII. 6; XX. 11; XXV. 1, 6, 10, 11, 13, 14; XXIX. 8, 12; XXXII. 11, 12, 15, 16; XXXIII. 1, 2, 6, 8, 9, 10, 11, 13; XXXIV. 6; XXXVII. 4; XXXIX. 11; XL. 8; XLI. 9; XLVI. 12, 16; XLVII. 3, 4, 5, 6, 9, 13, 14; LIII. 4, 8, 12; LIV. 1, 2, 3, 4, 11, 12; LVI. 13; LX. 10, 14, 15; LXIV. 2, 8. **Glamorganshire**, I. 15, 16; II. 11, 13, 15, 16; VII. 14; VIII. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 16; XXII. 4, 7, 8, 11, 12, 16; XXXI. 4; **Hertfordshire**, XXIII. 6; XXVI. 3; XXXIII. 9, 10, 14; XXXVII. 6; XXXVIII. 9, 13, 15; XLI. 12. **Kent**, XIII. 6; LVIII. 4; LXVIII. 2, 3, 5, 6, 11, 13; LXIX. 2, 4, 7; LXXIV. 14, 15, 16; LXXV. 4 and 8, 9, 10; LXXVI. 1 and 2; LXXVIII. 1, 3, 7, 15, 16; LXXIX. 7, 9, 10, 11, 12, 14, 16; LXXX. 11, 14; LXXXIII. 1, 3, 4, 6, 11, 15. **Northumberland**, I. 15, 16; III. 3, 4, 7, 8, 11, 12, 15, 16; IV. 1, 14; VI. 2, 3; VII. 1, 2; IX. 3. **Nottinghamshire**, V. 7, 10, 11, 14, 15; VIII. 1 and 2, 3, 5 and 6, 7, 9, 10; XIII. 2, 11; XVII. 8, 12. **Oxfordshire**, XLVI. 6, 7, 8, 11, 12, 15, 16; XLVII. 5, 6, 7, 9, 11, 13, 14, 15; XLIX. 4, 8, 12; L. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 16; LIII. 2, 3, 4, 7, 14; LIV. 1. **Surrey**, XIV. 8 (this country is now complete). **Sussex**, VII. 15; XVIII. 3, 8, 12, 16; XIX. 5, 14; XXX. 1, 7, 12; XXXI. 7, 8, 11, 12, 13, 14, 15, 16; XXXII. 11, 12, 13, 14, 15, 16; XLV. 4, 8; XLVI. 1, 9, 13. **Westmorland**, IV. 13, 14, 15; VII. 12; VIII. 1, 2, 3, 6, 7, 10, 11, 15; XIV. 14; XXI. 4; XXII. 1, 2, 3, 4, 8, 12; XXIII. 2, 5, 8, 10, 11, 12, 13, 14, 16; XXIV. 2, 5, 6, 9, 10; XXIX. 4; XXX. 1, 2, 3. 3*s*. each.

Miscellaneous:—One-inch Parish Indexes, printed in colours, showing 25-inch parish maps only: Sheets 2, 7, 8, 10, 25, 85, 86, 98, 99, 110, 204, 221, 222, 223, 224, 257, 271. *Price* 1*s*. each. These are also published showing 6-inch quarter-sheets only, *price* 1*s*. each.

(E. Stanford, Agent.)

German Marine Atlas. **Langhans.**

Justus Perthes' Deutscher Marine-Atlas. Bearbeitet von Paul Langhans. Gotha: Justus Perthes, 1898. *Price* 1 *mark*.

This little atlas contains five sheets of maps, all of which have reference to German colonies and commerce, as well as German naval stations. A large amount of statistical and general information is given in the introduction.

Historical Atlas. **Poole.**

Historical Atlas of Modern Europe, from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World, connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of

Magdalen College and Lecturer in Diplomatic in the University of Oxford. Part xx. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston, 1898. *Price 3s. 6d. each part. Presented by the Clarendon Press.*

Part No. xx. of this atlas contains the following maps: No. 13, Europe (1814–1863), by Prof. G. W. Prothero, LITT. D.; No. 57, Gallia Sacra, by W. E. Rhodes, M.A.; No. 80, Western Asia under the Mongols (A.D. 1330), by Stanley Lane-Poole, M.A. Each of these maps is accompanied by letterpress.

Hungary. **Direction Générale R. H. des Postes et des Télégraphs.**

Carte Postale et Télégraphique des Pays de la Couronne de Hongrie. Scale 1 : 576,000 or 9·1 stat. miles to an inch. Direction Générale R. H. des Postes et des Télégraphs, Budapest, 1898. *Presented by R. K. Gray, Esq.*

This map shows all the administrative divisions of the Kingdom of Hungary, with the telegraphs and means of postal communications. Inset plans are given of Budapest, and one of South-Eastern Europe.

Iceland. **Thoroddsen.**

Geologische Karte eines Teiles des nördlichen Island. Scale 1 : 800,000 or 12·6 stat. miles to an inch. Von Th. Thoroddsen, 1896. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 16. Gotha: Justus Perthes. *Presented by the Publisher.*

Novaya Zemlya. **Buschtejew.**

Aufnahme der Bjeluschja- und Rogatschew-Bai, Nowaja Semlja, von Schiffsleutnant A. v. Buschtejew, 1896. Scale 1 : 250,000 or 3·9 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1898. Gotha: Justus Perthes. *Presented by the Publisher.*

ASIA.

Chinese Empire and Japan. **Philip.**

Special Map of the Chinese Empire and Japan, showing the recent Railway Concessions. Scale 1 : 9,855,000 or 155·6 stat. miles to an inch. George Philip & Son. London, 1898. *Price 1s. Presented by the Publishers.*

Persia. ———

Map of Persia. Scale 1 : 1,900,000 or 30 stat. miles to an inch. In Persian character. *Presented by A. P. H. Hotz, Esq.*

Siberia. **Petermann's Geographische Mitteilungen.**

Tiefenkarte der Ob- und Jenissei-Mündungen. Nach den Aufnahmen der russischen Marine in den Jahren 1894 bis 1896. Scale 1 : 3,500,000 or 55·2 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 17. Gotha: Justus Perthes. *Presented by the Publisher.*

Transcaspian. **Radde and Konschin.**

Karte der transkaspischen Gebiete und von Nord-Chorassan. Hauptsächlich nach General J. Stebnitzkis Karte von Transkaspien mit Nachträgen und den Routen der Forschungs-Expeditionen unter Dr. G. Radde und J. M. Konschin, 1881 bis 1886. Scale 1 : 2,250,000 or 33·9 stat. miles to an inch.—Nebenkarte: Oase Merw. Scale 1 : 1,250,000 or 17·7 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Ergänzungsheft, No. 126. Gotha: Justus Perthes. *Presented by the Publisher.*

AFRICA.

Africa. **Service Géographique de l'Armée, Paris.**

Carte de l'Afrique. Scale 1 : 2,000,000 or 31·1 stat. miles to an inch. Sheets: 19, Agadez; 20, Yayo; 37, Barderah. Service Géographique de l'Armée, Paris. *Price 1 fr. each sheet.*

Africa. **Philip.**

Special Map of Africa showing Treaty Boundaries. Scale 1 : 16,379,200 or 258 stat. miles to an inch. George Philip & Son, London, 1898. *Presented by the Publishers.*

Algeria. **Service Géographique de l'Armée, Paris.**

Carte d'Algerie. Scale 1 : 50,000 or 0·78 stat. mile to an inch. Sheets: 99, Sedrata, 131 Ammi Moussa. Service Géographique de l'Armée, Paris. *Price 1.50 fr. each sheet.*

Egypt. **Philip.**

Map of the Nile Valley, showing the approaches to Khartum. Scale 1 : 8,395,000 or 132·5 stat. miles to an inch.—Special Map of the Nile from Dongola to Khartum. Scale 1 : 1,013,760 or 16 stat. miles to an inch.—Environs of Omdurman. Scale 253,440 or 4 stat. miles to an inch. George Philip & Son, London, 1898. *Price* 1*s*. *Presented by the Publishers.*

Tunis. **Service Géographique de l'Armée, Paris.**

Carte topographique de la Tunisie. Scale 1 : 50,000 or 0·78 stat. mile to an inch. Sheets : lxv., Djemmal. Service Géographique de l'Armée, Paris. *Price* 1.50 *fr.*

AMERICA.

Bolivia. **Cisneros and Garcia.**

Mapa de Bolivia. Scale 1 : 3,410,700 or 53·8 stat. miles to an inch. By C. B. Cisneros and R. E. Garcia. Lima, 1897.

Chile. **Delegacion Fiscal de Salitreras.**

Plano de la Region Salitrera desde Arica a Tocopilla. Scale 1 : 202,752 or 3·2 stat. miles to an inch. Delegacion Fiscal de Salitreras, Iquique, 1896. *Presented by the Director of the Biblioteca del Instituto Nacional, Santiago de Chile.*

The object with which this map is published is to show the position and extent of the nitrate deposits. The map includes the country lying between Arica and Tocopilla on the coast, and 68° west longitude. All means of communication are laid down, and the heights of a few places near the railway stations and aqueducts are given. Though this map will be principally of value to those interested in the nitrate industry, it also contains much geographical information with regard to this desert region.

GENERAL.

World. **Bartholomew.**

The Citizen's Atlas. One hundred maps and gazetteer. By J. G. Bartholomew, F.R.G.S. Published by George Newnes, Ltd., London. To be completed in 20 parts, issued fortnightly. Parts 17, 18, and 19. Price 6*d*. each.

World. **Andree.**

Andrees allgemeiner Handatlas, 126 Haupt- und 130 Nebenkarten auf 186 Kartenseiten, nebst alphabetischem Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Bielefeld und Leipzig : Verlag von Velhegen and Klasing, 1898.

Lief 34, Südeuropa und Mittelmeer, Verkehrskarte : Persien. Afghanistan und Balutschistan.—Lief 35, Westafrikanische Kolonialkarten : Deutsch-Ostafrika : Südwestliche Vereinigte Staaten and nördliches Mexico.—Lief 36, Verkehrskarte des Atlantischen Ozeans : Vorderindien, nördlicher Teil.—Lief 37, Ungarn und Galizien ; Algerien und Tunesien.—Lief 38, Übersichtskarte von Asien. Price 50 *pf. each part.*

CHARTS.

Ocean Currents. **Jordan.**

Charts of the World, North and South Atlantic Oceans, North Atlantic from the British Isles to the Mediterranean Sea, and the N.W. portion of the North Pacific Ocean, illustrating Ocean Currents and Tide Waves. By W. Leighton Jordan. *Presented by W. Leighton Jordan, Esq.*

These are Admiralty Charts, on which Mr. Leighton Jordan exhibits the ocean currents and tide waves, according to his theory. In addition to the coloured lines indicating the currents, numerous explanatory notes are given upon each chart.

Portuguese Charts. **Commissão de Cartographia, Lisbon.**

Plano hydrographico da Enseada da Agoada e Barra do Rio Mandovi Goa. Scale 1 : 10,000 or 0·15 stat. miles to an inch, 1898.—Reconhecimento da Bahia e Rio Conducia Moçambique. Scale 1 : 31,680 or 5 stat. miles to an inch. Ministerio da Marinha e Ultramar, Commissão de Cartographia, Lisbon, 1898. *Presented by the Commissão de Cartographia, Lisbon.*

Russian Charts. **Chief Hydrographic Department, St. Petersburg.**

Charts and Plans published by the Chief Hydrographic Department, Ministry of Marine, St. Petersburg.

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic and North Pacific Oceans for October and November, 1898. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

The Baltic.

No.

1793. Index Sheet of Charts and Plans of the Gulfs of Finland, Mohn Sound, and Riga. Published in 1897; corrected in 1898.

199. Plan of the Soundings at the Mouth of the River Pernova (Gulf of Riga), 1898. Scale 700 feet to an inch.

1698. General Chart of the Gulf of Bothnia. Compiled from the latest Russian and Swedish Charts. Published in 1882. Scale 11 stat. miles to an inch. Plan of the Entrance into the Roadstead and Harbour of Hango. Surveyed in 1839. Scale 3500 feet to an inch.

1661. Index Sheet of the Charts and Plans of the Baltic Sea, with the rocks of Abo and Aland, the Mohn Sound, and the Gulf of Riga. Published in 1898.

1786. Index sheet of the Charts and Plans of the Gulf of Bothnia. Published in 1898. Scale 18 stat. miles to an inch.

1758. Chart of the Central Part of Mohn Sound, south of the Island of Vorms. Published in 1896; corrected in 1898. Scale 2745 feet to an inch.

1323. (*a*) Chart of the Western Coast of the Gulf of Bothnia, from the Svartklubben lighthouse to the city of Hudiksvall. Compiled from the Swedish chart of 1866; published in 1867; and corrected 1890–98. Scale 3·1 stat. miles to an inch.

(*b*) Plan of the Entrance into Gefle (Sweden). Scale 1·2 stat. mile to an inch.

490. Chart of the Roadstead of Riga and the Mouth of the Western Dvina. Surveys and sounding of 1848–91 and 1896; published in 1897. Scale 2059 feet to an inch.

190. Plan of the Mouth of the River Narova, 1898. Scale 700 feet to an inch.

The White Sea and Arctic Ocean.

1803. Charts of the Roadstead of Onega and of the Entrances into the River Onega. According to the Hydrographic Survey of the White Sea, 1888–90. Published in 1895; corrected in 1898. Scale 3500 feet to an inch.

493. Plan of Survey and Soundings near Kuya, on the river Petchora. Published in 1898. Scale 700 feet to an inch.

1299. Chart of the Coast of Russian Lapland, from Kildin Island to Ribachi Peninsula. According to Captain Lütke and Lieut. Reinike. Published in 1840. Corrected according to Norwegian Survey of 1849, and Russian Surveys of 1870, 1888, and 1893–98. With Plans.

500. Plans of Anchorages on the Coast of Russian Lapland. Published in 1898.
(*a*) Bolshaya Ainof Island. Scale 1890 feet to an inch.
(*b*) The Creek Bolshaya Volokovaya. Scale 2380 feet to an inch.
(*c*) Anchorage near Malyi Island, Kildin. Scale 2380 Russian feet to an inch.
(*d*) Plan of the Lake Mogilnoye, in the south-east part of Kildin Island. Scale 2380 feet to an inch.

504 (A.) Provisional Plan of Part of Berezovyi, arm of the Northern Dvina, from the Modyukski Lighthouse to the Harbour of Lapominka. Surveys of Lieut. Kolinin, 1891–93; and published in 1898. Scale 5·3 stat. miles to an inch.

504 (B.) Provisional Plan of the River Maimaksa, from the Harbour of Lapominka to the city of Archangel. Surveyed by Lieut. Kolinin, 1891–93; published in 1898. Scale 2800 feet to an inch.

1805. Chart of the Gulf of Kovda, in the Gulf of Kandalak. Survey of 1891; corrected in 1898. Scale 2164 feet to an inch.

1804. Plans of the Channel in the Roadstead at the village of Porya, and of the anchorage in this Roadstead (Kandalak coast). Scale 3580 feet to an inch for the channel, and 1792 feet to an inch for the anchorage.

1802. Chart of the Soroka or Sorokskaya Creek, in the Bay of Onega. Surveys, 1887, 1888, 1893, and 1894; published in 1896; corrected in 1898. Scale 3500 feet to an inch.

1801. Chart of the Roadsteads of Solovetzk. Surveys 1889 and 1892; published in 1895; corrected in 1898. Scale 525 feet to an inch.

510. Plan of Nakhodka Creek in the Gulf of Obi. Constructed according to Survey of the Hydrographic Expedition for the study of the estuaries of the Yenisei and Obi, and part of the Kara Sea, 1897. Published in 1898. Scale 3484 feet to an inch.

1747. Plans of anchorages in the Central Part of the West Coast of Novaya Zemlya: (1) Plan of the Bay Melkü; (2) Plan of Pomorskaya or

Staroverskaya Creek; (3) Plan of the Western Mouth of Matyushin Shar; (4) Plan of Gribovaya Creek.

491. Plan of the Soundings along the Coast of Alekseyef (Yerupan) Island, in the mouth of the River Petchora. Surveyed in 1894; published in 1898.

492. Plan of the Bay of Bolvansk, in the estuary of the Petchora River. Surveyed by Lieut. Prestin, 1894; published in 1897.

497. Plan of the Southern Part of the Bay of Kola. From surveys and soundings by Captain Deploranski and officers of the cruiser *Djigit*, 1895. Published in 1898. Scale 2100 feet to an inch.

1518. Chart of the Northern Coast of Russian Lapland. From surveys by Captains Lütke and Reinike, 1822–32, and from the Norwegian chart of Captain Bibi, 1848; corrected in 1890, 1892–98. Scale 9·4 stat. miles to an inch.

1284. (*a*) Chart of the Coast of Lapland, from the Gulf of Zelenetzkaya to the Gulf of Varishikha. By Captains Lütke and Reinike, 1840; corrected in 1890, 1892–98. Scale 3·9 stat. miles to an inch.

(*b*) Chart of the Strait of Kildin and the Gulfs Zelenetzkaya and Dolgaya. By Captains Lütke and Reinike, 1822 and 1826.

(*c*) Chart of the Gulf of Teriborsk. By Captain Lütke in 1823; corrected in 1890 and 1892–98.

(*d*) Plan of the Island of Voronyi Ludki and the cantonment of Gavrilovoye. Surveyed by the officers of the transport *Samoyed*, 1897.

(*e*) Chart of Oleni (Reindeer) Island. By Captain Lütke in 1822; corrected in 1890, 1892–98.

The Black and Caspian Seas.

1781. Chart of the South-Eastern Coast of the Crimea from Cape Panagi to Fort Cudak. Description of the Black Sea Hydrographical Expedition, 1872–93. Published in 1897; corrected in 1898. Scale 2 stat. miles to an inch.

1794. Chart of the Gulf of Karkinitzki (West Coast of the Crimea). Surveyed by Black Sea Hydrographical Expedition, 1874–91; published in 1898. Scale 2·3 miles to an inch.

1732. Chart of the North-Eastern Part of the Black Sea from the Strait of Kepchenski to the creek of Gelendjukski. Surveyed by the Black Sea Hydrographical Expedition, 1871–85. Published by the Administration of Lighthouses and Pilots of the Black Sea and Sea of Azof in 1889; corrected in 1892, 1895, 1897, and 1898.

Plan of the Roadstead of Anapa. Described by the Black Sea Hydrographical Expedition, 1873, 1876, 1884. With additions to 1898. Scale 3500 feet to an inch.

Plan of Gelendinski Creek. Surveyed by the Black Sea Hydrographical Expedition, 1875–84; published in 1898. Scale 800 feet to an inch.

1665. General Chart of the Caspian Sea, constructed according to astronomical observations, surveys, and soundings of 1858–71, under directions of Rear-Admiral Ivashinzof, and from 1871–78, under directions of Captain Pushchin. Published 1898.

1662. Chart of the Strait of Apsheron. Surveyed by Captain Ivashinzof, 1857–58; published 1860.

1568. Chart of the West Coast of Apsheron Peninsula. Surveyed in 1854–60 under direction of Captain Ivashinzof; published in 1862. Scale 2·8 stat. miles to an inch.

1789. Chart of Part of the Black Sea, from the town of Ochakof to the Liman of the Dniester, 1871–87; corrected to 1898. Scale 1·7 stat. mile to an inch.

The North Pacific Ocean.

383. Plan of Tyulenii (Seal) Island in the Bay of Patience, Sea of Okhotsk. By Lieut. Maksimof and M. Gulyarovski, 1891; published in 1898. Scale 280 feet to an inch.

496. Provisional Chart of the Bay of Possiet, and Expedition and Novgorod Creeks in Peter the Great Bay. Surveyed 1884–95; published in 1898. Scale 4540 feet to an inch.

1795. Chart of the Eastern Part of Kozakevich Island and Part of Muravief Amurski Peninsula, in Peter the Great Bay. Surveys of the Pacific, 1875–96; published in 1898. Scale 2798 feet to an inch.

1796. Chart of the Western part of Kozakevich Island in Peter the Great Bay. Surveyed 1881–91; published in 1898. Scale 2798 feet to an inch.

509. Plan of the Vostok Bay, with Gaidamak Creek in Peter the Great Bay. Surveyed in 1896; published in 1898. Scale 1400 feet to an inch.

507. Plan of the Gulf of America, with Nakhodka, Wrangel, and Kosmin Creeks in Peter the Great Bay. Surveys of the Pacific, 1896 and 1897; corrected in 1898.

1787. Index Sheet of the Charts and Plans of the Sea of Japan and Yellow Sea, with the Straits of Korea, Sangar, Tartary, and La Perouse. Published in 1897; corrected in 1898.

1657. Index Sheet of the Charts and Plans of the Seas of Bering and Okhotsk. Published 1897; corrected 1897–98.

506. Plan of the Bay of Ayan (Sea of Okhotsk). Surveyed by Staff-Captain Lelyakin, 1897; published in 1898. Scale 700 Russian feet to an inch.
Plan of the Gulf Zabiyaka and Van der Schruff Creek (Sea of Okhotsk). Surveyed by Staff-Captain Lelyakin, 1897; published in 1898. Scale 2800 feet to an inch.

512. Provisional Plan of Gulf of Ta-lien-wan. Survey of the officers of H.M.S. *Acteon* and *Dove*, 1860. Published in 1898. Scale 1·1 stat. mile to an inch.
Plan of the creek Odin. Survey of the officers of H M.S. *Immortality*, 1876.

488. Chart of the Northern Part of the Gulf of Tartary, from the estuary of the Amur to the Port of Imperator. Compiled from Hydrographical and Topographical Surveys of 1852–1883, and published in 1898. Scale 6·6 stat. miles to an inch.

271. Plan of Tikhaya Pristan Harbour (Calm Harbour) in the Bay of St. Olga, Sea of Japan. By Captain Krykof and M. Polovzof of the Corps of Naval Pilots, 1879. Published in 1898. Scale 348 feet to an inch.

480. Chart of Part of the East Coast of Korea, from Port Shestakof to Port Lazaref. Surveys, 1886-95; published in 1897. Scale 1·9 stat. mile to an inch.

508 (*a*) Plan of Port Lazaref and the Vensan Creek (Genzan), East Coast of Korea. From Russian surveys, 1854 and 1893-97, and Japanese surveys of 1878; published in 1898. Scale 1 stat. mile to an inch.
(*b*) Plan of Unkovski Creek on the East Coast of Korea. Surveyed by officers of the frigate *Pallada*, 1889. Scale 1·1 stat. mile to an inch.

505. Plan of the Harbour of Petropavlovsk (Kamchatka), survey of the cruiser *Kreuzer*, 1896; published in 1898. Scale 385 feet to an inch.

298. Plans of Harbours and Creeks on the East Coast of Karyakskaya Zemlya, Kamchatka:—(1) Part of the Southern Part of Ugolnaya Creek; (2) Plan of Ugolnaya Creek, between Capes Faddei (Thaddeus) and Günter; (3) Plan of Archangel Gabriel Creek; (4) Plan of the Harbour of Natali; (5) Plan of the Harbour of Lavrof; (6) Plan of Anastasius Creek; (7) Plan of the Harbour of Glubokaya; (8) Plan of the Entrance into the Harbour of Skrytaya; (9) Plan of Karaga Harbour; (10) Plan of Lojnikh Vestei Creek; (11) Chart of Baron Korf Bay, with Harbours. Published in 1898.

501. Chart of Komandorski Island (Commander Group) in the South-Western part of Bering Sea. Corrected by Lieut. Stahl, Hydrographic Survey of the cruiser *Zabiyaka*, 1894, with additions from Plans of Steinger, 1897, and published in 1898. Scale 6·9 stat. miles to an inch.

502. Plans of Anchorages on the Coasts of Komandorski Islands, published in 1898:—(1) Plan of the Northern Coast of Bering Island, 1894; (2) Plan of the Southern Coast of Bering Island, 1895; (3) Plan of the Old Harbour on Bering Island, 1882; (4) Plan of Peschanaya Creek on Mednyi Island, 1882; (5) Plan of the Preobrajeniye harbour, 1882.

Presented by the Chief Hydrographic Department, St. Petersburg.

PHOTOGRAPHS.

Rockall. **Green.**

Photograph of Rockall, showing pitted weathering of the rock. By Rev. W. S. Green. *Presented by Rev. W. S. Green.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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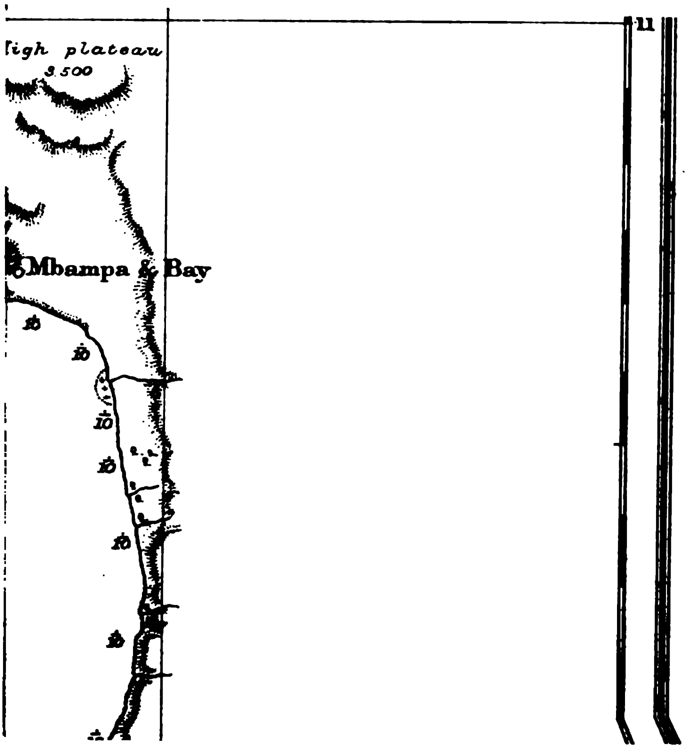

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